

THE DYNAMICS OF MANUFACTURING JOB LOSS:

A CASE STUDY OF RHODE ISLAND, 1978-83

by

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Submitted to the Department of Urban Studies and Planning
in Partial Fulfillment of the
Requirements of the Degree of
Doctor of Philosophy

at the

Massachusetts Institute of Technology

May 1987

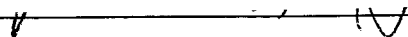
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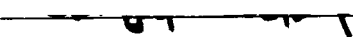
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Abstract

The thesis is concerned with gaining understanding of the dynamics of job loss in the U.S. manufacturing sector through analyzing the magnitude of and reasons for employment change in Rhode Island industry between 1978 and 1983. It is posited that a lack of understanding regarding these dynamics hinders the development of effective regional economic development policies. The data base for the study was formed using ES-202 establishment data, a telephone survey, secondary sources and personal interviews. The data base covers all 583 manufacturing establishments in the state which had 50 or more employees in at least one year between 1977 and 1983.

The analysis of the components of employment change at the plant level indicates that plant contractions are the primary source of gross job loss; that a significant portion of jobs lost to contractions are regained the next year; and that plant closings contribute substantially to job loss, and increasingly as economic conditions worsen. A comparison of the findings of the gross flows analysis in this study with others in the field indicates that the latter were seriously flawed because data bases were not truly longitudinal.

A combination of logit regression models and qualitative analysis indicates that a strong and complex set of relationships exists between plant organizational characteristics and the frequency of plant closure. Some organizational characteristics reflect firms' abilities to avoid management error that results in unintended plant closures and to perceive and opportunities; others guide firms' perceptions regarding viable options for plant site and product investment. Plant closures of four types occur--firm failures, product terminations, capacity reductions, and factor cost relocations. It is suggested that plant closures are the results of institutional responses to structural and macroeconomic opportunities and constraints. Structural and macroeconomic opportunities and constraints strongly influence the range of investment choices which a firm perceives before it.

There appears to be little relationship between organizational characteristics and contractions and expansions in open plants. An analysis of the relationship between plant operating characteristics and employment change, using U.S. Census Bureau data, could not be completed because of significant spurious plant closures in the file.

The study findings have a number of implications for economic development research and policy.

Thesis Supervisor: Bennett Harrison, Professor, Political Economy

TABLE OF CONTENTS

Acknowledgements	4
Chapter 1: Introduction	7
Chapter 2: Overview of the Rhode Island Manufacturing Sector	25
Chapter 3: Analysis of Gross Job Flows, Rhode Island, 1978-83	49
Chapter 4: The Relationship Between Plant Closings and Organizational Characteristics	79
Chapter 5: The Relationship Between Plant Employment Change and Organizational Characteristics	154
Chapter 6: An Assessment of the Usefulness of the U.S. Census Bureau's Longitudinal Establishment Data File for Analysis of Plant Closures	161
Chapter 7: Summary of Findings and Implications for Economic Development Research and Policy	175
References	194

ACKNOWLEDGEMENTS

The path to the completion of this thesis was a far stranger journey than I ever could have imagined when I began it. Along the way, numerous people provided helping hands and minds to move me on my way. Without Ira Magaziner and Mary Hackett, this project simply could not have been. Ira gave me the latitude and responsibility for carrying out the plant closure study for the Rhode Island Strategic Development Commission, an effort which served as the first stage of research for this thesis. Ira opened many doors to ensure I had adequate information on closed plants. In the process of working with and for him, I learned enough about economic development analysis to give me some sense of professional confidence.

Mary Hackett, the former director of the Rhode Island Department of Employment Security, allowed me access to needed data. I hope the results of this work justify the trust she showed demonstrated.

It has been a privilege to work with Bennett Harrison, my thesis adviser. Bennett has played a major role in shaping my thinking about economic development in general and about the structure, methodology, and findings of this thesis in particular. Edward Kaplan was my statistical guru in this research effort. I appreciate his volunteering for the role and the clarity and patience which with he provided guidance.

The degree of completeness of the Rhode Island plant data base is due in large measure to the efforts of Bryan Wyatt, who headed up the telephone survey. I will be forever grateful to Bryan for his diligence, commitment, creativity and enthusiasm in tracking down lost owners, untangling corporate hierarchies, and in making one call after another in an effort to get the answers.

To my partners at Mt. Auburn Associates, Beth Siegel and Peter Kwass, I give thanks for their long-term patience and periodic motivational talks as I moved towards

finishing this document. Their allowing me to use the facilities for my thesis made a this project a little easier.

Some seed capital, as it were, for this project was provided by the fellowship program of the MIT-Harvard Joint Center for Urban Studies. The good people at the Research and Technical Assistance Division of the U.S. Economic Development Administration funded a proposal from Mt. Auburn Associates to carry out a part of the analysis for this project, which allowed me to stay financially solvent as I carried on.

Numerous people on the Greenhouse project assisted me in my initial research efforts, including Tracy Fitzpatrick, Kay Scheidler, Gwen Hall, and the clipping file staff at the Providence Journal. Bob Bechtold of the U.S. Census Bureau's Center for Economic Studies spent a year in good humor with me as we puzzled out the intricacies of an analysis that ultimately was not to be. Between George Nee and Joseph Shantz, the Rhode Island AFL-CIO office provided me with help and information throughout the project. Mona Hochberg and Josephina Bosch were helpful in carrying out the phone survey. I am grateful to Robert McKersie for serving as the third member of my committee. I hope we have a chance to work together again.

The emotional support of my friends and family were crucial in my seeing through this project to its completion. In particular I thank Paula Dickerman, Vince O'Donnell, Drew Bottaro, Arne Abramson, Rick Reamer and Deborah Siegel, the folks at 8 Lee St., and the Urban Guerrillas, who continually reacquaint me with the feeling of playing with winners.

CHAPTER 1

INTRODUCTION

Plant Closings and Contractions in U.S. Manufacturing

--Restructuring and Its Effects

Since the late 1970's, the U.S. manufacturing sector has been undergoing a restructuring with negative effects for workers and their communities unparalleled since the Depression.¹ The result has been the permanent dislocation of millions of workers from decent jobs, with consequent negative effects on these individuals, their families and their communities. Employment in the U.S. manufacturing sector has decreased every year since 1979, except for 1984. Compared to peak employment of 21 million workers in 1979, the total number of workers was down 9% (to 19.2 million) in 1986. The decline in production employment has been even steeper--14%. (See Figure 1.1.) The employment figures are barely 4% higher today than they were in 1983, at the bottom of the worst recession in the postwar period.

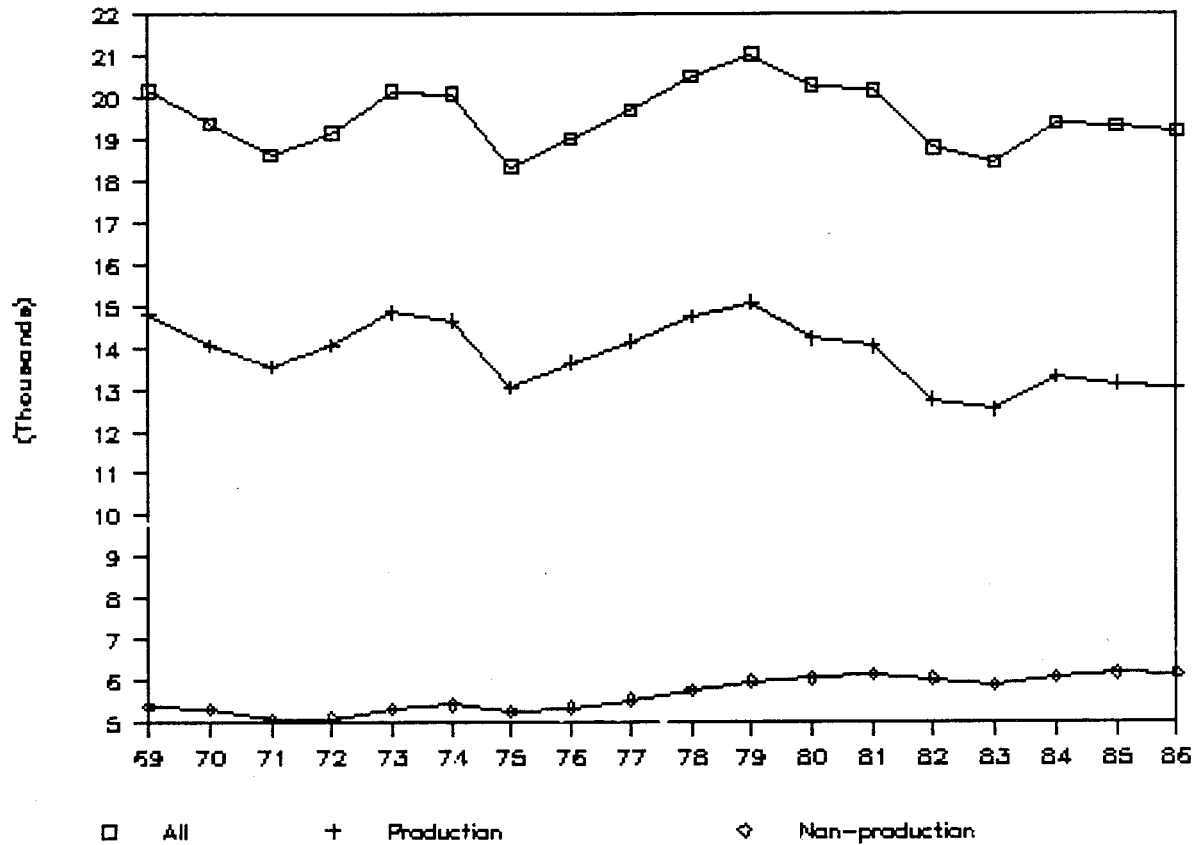
Change in aggregate employment statistics gives a sense of net employment decline. The gross job loss in manufacturing is of course greater. The U.S. Bureau of Labor Statistics estimates that between 1981 and 1986, over 2.5 million manufacturing workers with 3 or more years job tenure were laid off from their jobs.² In a previous BLS survey, covering the years 1979-84, it was estimated, disregarding length of job tenure, that 4.25 million manufacturing workers were displaced.³ Though manufacturing provided less than 20% of the nation's jobs, 50% of all displaced workers came from the manufacturing sector.

Job displacement has not been evenly distributed across all manufacturing industries. Since the late 1970's, the primary metals, machinery, fabricated metals, textiles, and apparel industries each has lost over 200,000 net jobs. The leather goods, pri-

Figure 1.1

U.S. Manufacturing Employment

1969-85



Source: U.S. Bureau of Labor Statistics

mary metals and textiles industries each has lost 25% or more net employment. The apparel, motor vehicles, and stone, clay and glass industries also have lost significant numbers of workers.⁴

This downsizing and restructuring of the manufacturing sector has had a negative effect on relative wage scales--many lost jobs paid quite well and much of what manufacturing job growth has taken place has been in lower-wage sectors such as electronic components and plastics. In a recent study undertaken for the Joint Economic Committee of the U.S. Congress, Bluestone and Harrison indicate that the only segment of manufacturing jobs which showed any growth between 1979 and 1984 were those that paid less than \$7,400 annually (in 1986 dollars).⁵

While the nation as a whole has suffered as a result of manufacturing job displacement, those who have suffered the most are of course the individuals directly involved, with their families and their communities. Numerous studies have examined the consequences of job displacement. At the personal level, these consequences have included extended unemployment, lower pay when reemployed, loss of health and pension benefits, exhaustion of unemployment benefits, forced early retirement, geographic relocation in order to find new work, and mental and physical stress. Those workers most negatively affected are older workers, less skilled workers, minorities and women.⁶ The impact of these consequences do not stop with the workers involved, but extend directly to their families and communities. At the family level, the stress levels on spouses and children increase, as do divorce rates and child behavior problems.

Regions which suffer significant manufacturing job loss feel compounded impacts in the economic, fiscal and social spheres. Manufacturing is at the heart of most regions' traded sector (or economic base), that portion of the economy exports goods and services to other regions, and so provides the income which allows the importation of goods not produced locally. Moreover, average annual manufacturing pay is 29% above the average annual pay in other sectors, so the multiplier effect of consumer

purchases by workers is significant.⁷ Further, manufacturing tends to have more complex local backward and forward linkages than do other sectors. Consequently, the loss of a large number of good factory jobs can have a substantial negative impact on regional economic well-being. In addition to these economic effects, communities may be faced with a decreased tax base, increased expenditures for such social services as welfare, health care and counseling, decreased social cohesion and increased anti-social behavior.⁸

The costs of manufacturing job loss have been unevenly distributed across regions of the U.S. Areas dependent on manufacturing jobs in declining industries, particularly in the Midwest and Middle Atlantic areas, have felt the heaviest consequences.⁹ However, no area of the country is immune. In fact, some of highest rates of plant closure occur in areas of the South newly industrialized by branch plants.¹⁰

--Factors in the Restructuring Process

While there is little room for doubt that a restructuring in manufacturing has been occurring, with its attendant costs, there is less agreement about the factors which cause job loss. As the economic world is a complex place, a large number of causes have been proposed. For the most part, these perceptions are not mutually exclusive; each offers a different emphasis. What is unclear is the extent to which the various causes suggested are important in explaining the restructuring process. Suggested causes of job loss can be roughly grouped into three categories--macroeconomic, structural and institutional.

Macroeconomic factors. The thrust of the macroeconomic argument is that currency exchange rates and sluggish aggregate demand are behind the decline in manufacturing. Falling domestic demand brought on by the recessions of the early 1980's produced plant closings and job loss. In its latest annual report, the President's Council of Economic Advisers states that the problems of the U.S. manufacturing sector

have been primarily the result of a strong dollar, making imports cheap and exports expensive. It adds sluggish foreign demand as a factor.¹¹

Structural factors. The structuralist orientation to economic development seeks to explain dynamics behind patterns in the spatial, technological and corporate organization of economic activity. Industrial restructuring appears as a logical outgrowth of increasing national and international capitalist competition, made possible by improvements in communications and transportation technology and spurred by increases in the manufacturing capacity of newly developed nations. While industrial restructuring is not new, it has taken on increased speed and force in the last decade. Three manifestations of the restructuring process directly result in job loss: technological change that increases labor productivity; the geographic dispersion of the productive capacity of large multi-plant companies in order to reduce the labor and social costs of production; and the elimination of productive capacity in a number of firms, including outright firm failures, because they are no longer cost competitive.

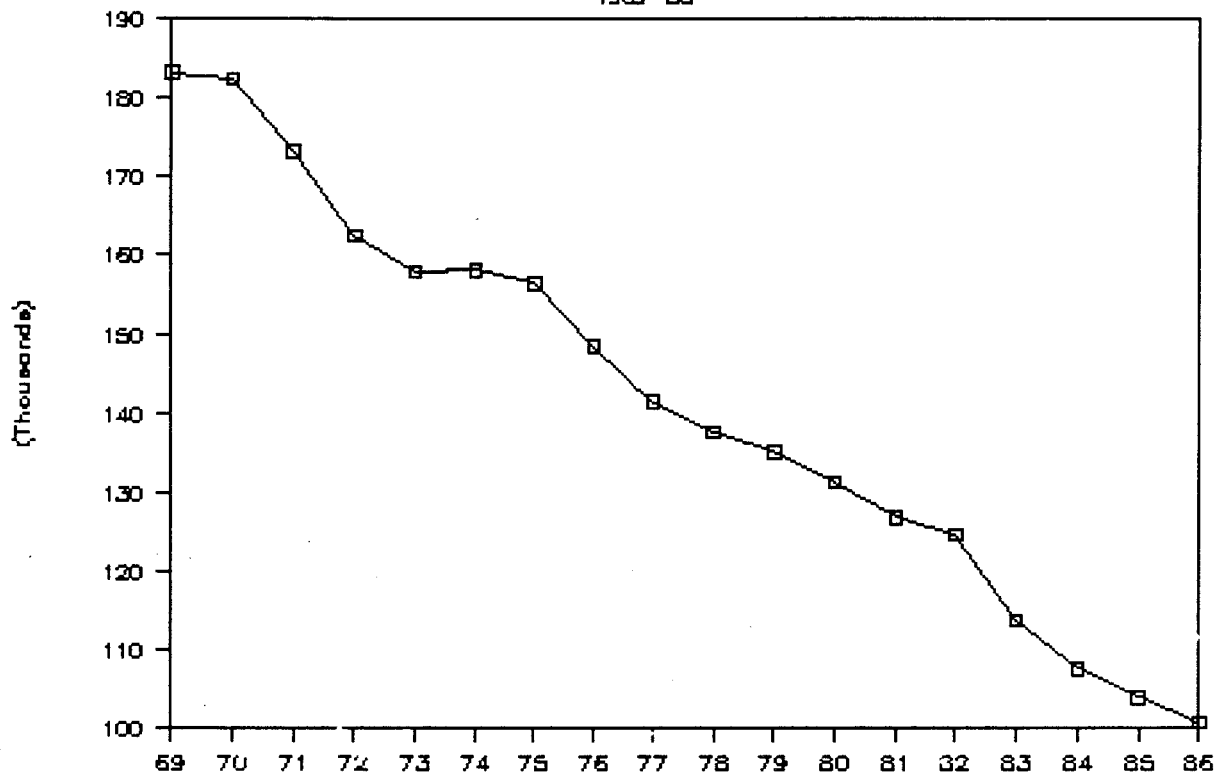
Government statistics show a startling increase in the productivity of production workers in the last two decades. While the number of production workers today is down 12% (1.75 million workers) compared to 1969, factories are producing 60% more output, as measured by the Federal Reserve Board's index of manufacturing output.¹² When the employment and output figures are transformed into a measurement of the number of production workers it takes to produce one index point's worth of output, we can see that manufacturing labor productivity has almost doubled in 17 years. What once took 183,000 workers now takes 101,000.¹³ (See Figure 1.2.) Bluestone, et.al., suggest that for the majority of industries with job loss in the 1970's, productivity enhancement was the leading cause of job loss.¹⁴

The structuralist perspective on the geographic dispersion of manufacturing, dubbed the profit cycle theory of industrial location by Ann Markusen, has been suggested by many theorists and supported by a number of empirical studies.¹⁵ Over the

Figure 1.2

US Mfg. Prod. Workers/Index Pt. Output

1969-86



Derived from BLS and Federal Reserve data

last 40 years, there has been a well-documented flow of new manufacturing capacity into the less industrialized areas of the U.S. and, more recently, overseas by U.S. corporations. This movement is perceived as representing the drive to find lower-cost sites of production for operations in the standardized portion of the product life cycle, sites with what in present-day parlance is known as good "business climate"--the availability of low-wage labor, the absence of unions and a relatively low degree of state intervention in the form of taxes and regulation. In a landmark study of the business location decisions of Fortune 500 firms, Roger Schmenner found that a favorable labor climate was the most frequently mentioned influence on plant location.¹⁶ Further weight to this perspective is lent by the beneficiaries of "good business climate" themselves. Each year, the accounting firm of Grant Thornton publishes an index of state manufacturing climates based primarily on the types of criteria mentioned above--wage costs, unionization, unemployment and workers' compensation costs, and tax rates. Labor-related costs account for 63% of each state's final score. Moreover, it is the opinion of state manufacturing associations which determine the weights of each factor in determining the rankings.¹⁷

From a structural point of view, a third source of major job loss is the elimination of productive capacity that is unable to compete on the basis of cost. For the most part, this means reductions in the ranks of smaller firms who cannot attain the economies of scale of larger ones and contractions in plants of all sizes who cannot compete with plants in low-wage locations.¹⁸

In large part, the causes of manufacturing job loss suggested by the structuralist perspective revolve around increases in the concentration of manufacturing capacity. Many firms have been tantalized by and acted on the belief that bigger is better in terms of control of market share, economies of scale, and profits. The merger and acquisition binge of the last decade is testimony to that. The growth in the concentration of capital has stimulated the development and implementation of labor-saving technol-

ogy, the geographic dispersion of productive capacity and the competitive weakness of smaller and higher-cost firms.

Institutional factors. Institutional suggestions regarding manufacturing job loss flow out of a perception that certain characteristics of U.S. manufacturing and economic institutions encourage corporate behavior that looks profitable in the short-run, but is self-defeating in the long-run for both the companies and the economy. One basic institutionalist argument is that the domination of the U.S. stock market by institutional investors looking for quick, high returns and their lack of hesitancy in jumping from one stock to another has encouraged a corporate emphasis on short-term profitability at the expense of long-term investment and profitability. Structural theory emphasizes as the motivating factor in the restructuring process large corporations' search for better ways to compete over cost; institutionalists point out corporate overemphasis on lowering costs as the means to quicker profits and to the detriment of innovation and product development, those factors which determine the long-run profitability of the firm. It is suggested that the short-term orientation has pervaded corporate attitudes towards investment (by undervaluing it), labor relations (by undervaluing the contribution which can be made by workers who are treated with dignity and respect), promotions (rewarding quarterly, not long-term results), operations management (underemphasizing it in favor of marketing and finance) and risk (penalizing failure for risk-taking too highly).¹⁹

The second thread of the institutionalist argument parallels the first. Not only have minority investors shifted investment from firm to firm in search of profits, but so have controlling owners. The theory that shareholders should have a diversified portfolio of stocks to even out unsystematic risk was transferred to the realm of conglomerate ownership beginning in the 1960's.²⁰ From the 1960's through the next decade, the trend was for large corporations to develop a stable of diversified firms. However, for reasons of omission and commission, this approach seems to not have

worked well. A corollary to the diversified portfolio theory was for conglomerate ownership to "milk" the profits of subsidiaries with low returns and reinvest these funds in the more profitable subsidiaries. When the "milked" subsidiary could no longer meet the required rate of return, it was scrapped.²¹ Many times, the tax advantages of liquidating the subsidiary were greater than the benefits of selling or reinvesting to make it profitable again.

The problem of omission simply was that new owners with little experience in the market of the acquired firm did not know how to run it and so ran it poorly. A study by Ravenscraft and Scherer indicates that the performance of conglomerate-acquired subsidiaries tended to decrease significantly after acquisition because of lack of managerial competence.²²

Some observers suggest that manufacturers who are not headquartered at or near the site of production are much more likely to disperse production activity than are firms headquartered locally. One apparent consequence of non-local buyouts of once locally-owned firms by conglomerates and non-conglomerates alike is lowered stability of local employment. Local firms are much more likely to maintain local operations because of local ties to family and community.²³

The third thread of an institutional approach concerns plant closings as a result of firm failures due to management error. At any point in time a certain number of firms will fail regardless of industry or cyclical conditions. Researchers investigating the characteristics of failed firms have found that lack of necessary management skills provides the major explanation of firm failure in manufacturing. Firm failure as result of lack of management skills most frequently occurs in privately-held, locally-owned firms. Often, failure occurs soon after firm startup or change of ownership.²⁴

--Economic Development Policy Responses to Manufacturing Job Loss

The Reagan Administration's economic development policy response to the problems of restructuring has been noticeable by its absence. Attention has been paid primarily to macroeconomic issues, and with little results. Ideology has dictated a hands-off approach to issues which the Administration sees as being in the domain of the private sector and state and local governments. State and local governments are left to respond to the economic problems engendered by restructuring.

With or without Federal support, states and localities would have been forced to undertake active development policies. Because each regional economy is unique in terms of the structure and health of its industrial base, the problems that each region faces are unique as well. Therefore, to some extent each must come to its own solutions. The pain of past layoffs, the economic necessity of not standing still in times of a global economy, and political pressures have forced local politicians and policymakers to take a more active and thoughtful role in economic development than they traditionally have in the past.

Slowly but surely, many states and regions are striving to create effective development policies which seek to maintain existing good manufacturing jobs and create new ones. This is not an easy task. Many issues are beyond the capabilities of states and cities, e.g., those of trade, the dollar, and foreign entrants. Moreover, with growth coming so easily in the past, expertise in economic development is in short supply. However, state and local policies can make a difference. One lesson being learned is that effective economic development policies cannot be blindly copied from other regions. Because the structure of each regional economy is to some extent unique, effective policies best grow out of an in-depth understanding of the dynamics of change in the regional manufacturing base. However, hand in hand with lack of expertise in economic development is lack of information that provides such understanding.

The Purpose and Structure of the Dissertation

--The Need for Information on the Dynamics of Region Industrial Change

Regarding recent patterns in regional manufacturing employment, researchers and policymakers lack sufficient information in two key areas. First, they do not have an adequate sense of gross flows of job losses and job gains. While a number of national and regional studies have utilized Dun and Bradstreet or ES-202 unemployment insurance data to track gross job flows over a period of time, these studies have a major failing in that they identify establishment births and deaths through account commencements and terminations. However, it appears that a large number, if not the majority, of account terminations are the result of changes on ownership or legal structure, not actual deaths and births.²⁵ Consequently, the counts of gross job flows are inaccurate.

Second, researchers and policymakers need more information regarding the macroeconomic, structural and institutional factors associated with changes in manufacturing plant employment. Policy design would be strongly aided by a better understanding of the extent to which particular factors seem to induce job loss. As industrial structure varies by region, the importance and interaction of assorted factors will vary as well. Even so, there is little solid statistical evidence in any region regarding the role of various factors.

The lack of information on gross job flows and the underlying factors hampers the development of effective state and local economic development policies aimed at maintaining existing decent manufacturing jobs and creating new ones. In the absence of good information, policies are primarily designed around folk wisdom and anecdotal evidence.

--The Structure of the Dissertation

The purpose of this dissertation is help fill the informational and methodological vacuum through the examination of the 582 manufacturing plants in the state of Rhode Island which had 50 or more employees in at least one year during the 1977-83 period. First, using ES-202 data, I describe gross job change through plant deaths, contractions and expansions between 1978 and 1983, years which represent the peak and nadir, respectively, of recent manufacturing employment in Rhode Island. In contrast to most other studies, plant births and deaths have been verified through a telephone survey and newspaper clipping research. Second, using data gathered in the telephone survey, I examine the statistical relationships between the plant characteristics and employment change, i.e. the frequency of plant closings and actual and percentage change in plant employment in the 1978-83 period.

Rhode Island is a logical choice for a case study. Its small size allows the manufacturing base of the whole state to be examined in detail. The state has been relatively dependent on manufacturing in general and on a few industries hit by significant job loss in particular. Thus, its study should offer insights into the dynamics of manufacturing job loss.

A prior section described a large number of factors to which manufacturing job loss can be reasonably ascribed. To fully explore the influences of and interactions among the various factors in Rhode Island plant closings would require analyses not only at the level of the firm, but at the level of each plant's industry, to get at structural dynamics. Of course, the latter type of analysis is not feasible for a population of plants that represents hundreds of industries. The primary research here is focussed at the level of plant and firm characteristics, though secondary source material on particular industry structures, particularly jewelry and textiles, is introduced as context. Specifically, I examine relationships between employment change and organizational characteristics that seem relevant in light of the suggested causes of closings and

contractions--e.g., firm age, location of headquarters, firm run by original family or acquired, presence or absence of a union, and plant product. This approach is a cost- and time-effective method for gathering information on and testing a relatively large number of variables over a whole population.

I originally had hoped that the effect of plant operating characteristics, such as wage rates and labor productivity, could be analyzed through use of the Census Bureau's Longitudinal Establishment Data file (LED). Unfortunately, as with other account-based establishment data bases, the analysis contained significant numbers of spurious plant births and deaths, so the results were not meaningful.

One consequence of the methodological focus on quantifiable organizational characteristics is that I do not directly measure a number of factors external to the firm or not easily quantified, e.g., the effects of the strong dollar, changes in foreign demand and supply, change in production technology, and quality of management. However, some of the variables will be proxies for these factors. For instance, firm age is a stand-in for management skills, under the hypothesis that the younger the firm, the shakier the enterprise. One variable, national employment change in the plant's industry, reflects a number of external forces whose effect cannot be clearly seen at the plant level in this analysis, e.g., technological change, foreign competition, and shifts in aggregate demand and currency exchange rates.

In Chapter 2, I provide background information on that state's economy and its manufacturing sector. Using Rhode Island Department of Employment Security (DES) ES-202 establishment data, Chapter 3 gives us a sense of the gross job losses and gains between 1978-83, both on a year-to-year basis and over the period as a whole. Job losses are distributed between plant closings and contractions. Patterns in job recovery in the year subsequent to contraction are examined. In addition, the methodology and results will be compared to those of other such studies.

In Chapter 4, I examine the statistical relationships between plant characteristics and the frequency of plant closings. The core of this chapter is comprised of logit regression analyses, with the categorical dependent variable being plant was opened/closed as of December 31, 1983. The regressions are followed by an examination of the closed plants regarding the reasons for closure, both to explicate the regression findings and to see if additional patterns emerge.

In Chapter 5, I analyze the statistical relationships between plant organizational characteristics and plant employment change, using ordinary least squares regressions. The dependent variable is percentage plant employment change from 1978 to 1983, as measured using ES-202 data. The independent variables will be those used in Chapter 4 (or variations thereof).

Originally, Chapter 6 was to have consisted of an examination of the relationship between plant operating data (such as wage rates, cost of materials and labor productivity) and employment change (as measured by plant closings, actual and percentage employment change). The source of data for this analysis was to have been the LED, which covers all manufacturing establishments surveyed by the quinquennial Census of Manufactures. Because the LED is a confidential file, its plant operating data could not be integrated with the other analyses. Rather, I had to hire the Census Bureau to undertake a separate analysis. Unfortunately, it became clear that the extent to which the LED is actually longitudinal is severely diminished for the same reason that prior DMI and ES-202 studies are inaccurate. Plant closures could only be identified through plant number terminations, but many, if not most, plant number terminations in actuality represent changes in ownership. This fact was ascertained through a comparison of plant closure rates based on the DES/survey data base with those for the LED. Unlike DMI and DES, in theory the plant number terminations are to occur only in cases of actual closures, but this is not the case. Consequently, the chapter sets out

the planned analytic methodology and then provides the analysis that determined that the LED is not as fully longitudinal as I had hoped.

In the final chapter, I explore the policy implications of the findings of Chapters 3-5 for economic development policymakers. I end with a few concluding remarks regarding what I perceive to be the contributions of the thesis to the field of economic development.

CHAPTER NOTES

¹While the negative effects of the Depression certainly were much worse, those job losses were cyclical rather than structural in nature. Regional restructuring with large-scale negative effects has occurred, e.g., the loss of the New England shoe and textile industry in the 1940's and 1950's. However, on a national level, the sum total of recent job loss for reasons of structural change is unparalleled.

²U.S. Bureau of Labor Statistics, "Reemployment Increases Among Displaced Workers," News Release 86-414, October 14, 1986.

³Michael Podgursky and Paul Swaim, "Labor Market Adjustment and Job Displacement: Evidence from the January, 1984 Displaced Worker Survey," Department of Economics, University of MA, January 1986. The number of displaced manufacturing workers in the 1979-84 period with 3 or more years job tenure totalled 2.48 million, so the total job loss figure of 4.25 million should be roughly comparable to the 1981-86 total job loss figure, which has not been published.

⁴U.S. Bureau of Labor Statistics, Employment, Hours and Earnings, United States, 1909-1984, Volume I (March 1985) and Supplement (June 1986), Washington, DC: Government Printing Office.

⁵Barry Bluestone and Bennett Harrison, "The Great American Job Machine: The Proliferation of Low Wage Employment in the U.S. Economy," prepared for the Joint Economic Committee of the U.S. Congress, December 1986.

⁶The most recent compilation of studies of the consequences of job loss is contained in Office of Technology Assessment, U.S. Congress, Technology and Structural Unemployment: Reemploying Displaced Adults (Washington, DC: U.S. Government Printing Office, February 1986), Chapter 3: "Worker Displacement."

⁷U.S. Bureau of Labor Statistics, "Average Annual Pay by State and Industry, 1984," News Release 85-320, August 13, 1985.

⁸For a review of studies of the community effects of job loss, see Barry Bluestone and Bennett Harrison, The Deindustrialization of America: Plant Closings, Community Abandonment, and the Dismantling of Basic Industry (New York: Basic Books, 1982), pp. 67-81.

⁹U.S. Bureau of Labor Statistics, Displaced Workers: 1979-83, Bulletin 2240 (Washington, DC: Government Printing Office, July 1985).

¹⁰Bluestone and Harrison, The Deindustrialization of America.

¹¹Council of Economic Advisers, "Annual Report," in the Economic Report of the President (Washington, DC: Government Printing Office, January 1987), Chapter 3: "Growth, Competitiveness, and the Trade Deficit." See also Robert Lawrence, "The Myth of U.S. Deindustrialization," Challenge, November-December 1983.

¹²Economic Report of the President, Table B-45.

¹³This 44% decrease in the number of workers per index point of production does not take into account changes in the industrial mix over the period. However, measures at the two-digit industry level show similar change: machinery (51% decrease), foods (42%), motor vehicles (40%) and apparel (35%).

¹⁴Barry Bluestone, Bennett Harrison and Lucy Gorham, "Storm Clouds on the Horizon: Labor Market Crisis and Industrial Policy," (Brookline, MA: Economic Education Project, May 1984), p. 17.

¹⁵See Ann Markusen, Profit Cycles, Oligopoly and Regional Development (Cambridge, MA: MIT Press, 1985); Richard Walker and Michael Storper, "Capital and Industrial Location," Progress in Human Geography, v. 7 n.4, 1981; Richard Walker, "Two Sources of Uneven Development under Advanced Capitalism: Spatial Differentiation and Capital Mobility," Review of Radical Political Economics, Fall 1978; John Rees, Geoffrey Hewings and Howard Stafford, eds., Industrial Location and Regional Systems: Spatial Organization in the Economic Sector (New York: J.F. Bergin, 1981); Gordon Clark, "The Employment Relation and the Spatial Division of Labor: A Hypothesis," Annals of the Association of American Geographers, v. 71, n. 3, September 1981; Bennett Harrison, "Rationalization Restructuring and Industrial Reorganization in Older Regions: The Economic Transformation of New England since World War II," Working Paper No. 72, MIT-Harvard Joint Center for Urban Studies, February 1982; Larry Sawyers and William Tabb, eds., Sunbelt/Snowbelt: Urban Redevelopment and Regional Restructuring (New York: Oxford University Press, 1984); Richard Peet, "Relations of Production and the Relocation of United States Manufacturing Industry Since 1960," Economic Geography, v. 59, n. 2, April 1983; Doreen Massey, "The U.K. Electrical Engineering and Electronics Industries: The Implications of the Crisis for the Restructuring of Capital and Locational Change," in Michael Dear and Allen J. Scott, eds., Urbanization and Urban Planning in Capitalist Society (New York: Metheun, 1981).

¹⁶Roger Schmenner, Making Business Location Decisions (Englewood, NJ: Prentice-Hall, 1982), p.153.

¹⁷Grant Thornton, The Seventh Annual Study of General Manufacturing Climates of the Forty-Eight Contiguous States of America (Chicago: June 1986).

¹⁸For in-depth industry case studies to this effect, see Rhode Island Strategic Development Commission, The Greenhouse Compact: Cultivating Rhode Island's Fourth Economy (Providence, RI: January, 1984).

¹⁹See Robert Hayes and Steven Wheelwright, Restoring Our Competitive Edge: Competing Through Manufacturing (New York: Wiley, 1984); Jane Jacobs, Cities and the Wealth of Nations: Principles of Economic Life (New York: Vintage Books, 1985); Lester Thurow, Zero-Sum Society: Distribution and the Possibilities for Economic Change (Penguin Books, 1980); Richard Ellsworth, "Capital Markets and Competitive Decline," Harvard Business Review, September-October 1985; Ira Magaziner and Robert Reich, Minding America's Business: The Decline and Rise of the American Economy (NY: Harcourt, Brace, Jovanovich, 1982); The Business Week Team, The Reindustrialization of America (NY: McGraw-Hill, 1982).

²⁰Hayes and Wheelwright, op.cit.

²¹Barry Bluestone and Bennett Harrison, "Why Corporations Close Profitable Plants," Working Papers for a New Society, May/June 1980.

²²David Ravenscraft and F.M. Scherer, "Mergers and Managerial Performance," unpublished monograph, August 1985.

²³See Peter Doeringer, David Terkla, Gregory Topakian, "Reviving Mature Economies: Business Decision-Making, Invisible Factors and Local Economic Development," Institute for Employment Policy, Boston University, January 1986; Jane Jacobs, op.cit.; Cynthia Duncan, "Entrepreneurship and Economic Development," Kentucky Highlands Development Corporation, 1978; David McGranahan, "Absentee and Local Ownership of Industry in Northwestern Wisconsin," Growth and Change, April 1982.

²⁴See Rhode Island Strategic Development Commission, op.cit., Chapter 5; John Argenti, Corporate Collapse: Causes and Symptoms (NY: Wiley, 1976); Philip B. Nelson, Corporations in Crisis: Behavioral Observations for Bankruptcy Policy (NY: Praeger, 1981); Doeringer, et.al. op.cit.

²⁵See U.S. General Accounting Office, "Dislocated Workers: Extent of Business Closures, Layoffs, and the Public and Private Response" (Washington, DC: Government Printing Office, July 1986). This issue is explored in depth in Chapter 3.

CHAPTER 2

OVERVIEW OF THE RHODE ISLAND MANUFACTURING SECTOR

Rhode Island Industrial History to 1950¹

--Historical Review

From its founding in 1636 through the early 1700's, the Rhode Island economy was based primarily on agriculture. In the second half of the 18th century, economic emphasis shifted to maritime commerce and rum distilling. However, with the establishment of Samuel Slater's water-powered textile mill in 1793, Rhode Island quickly entered the industrial age. After 50 years of slow but steady growth, the state's industrial employment grew at a rapid pace--from 18,000 in 1840 to 153,500 in 1919. This industrial growth was centered around the cotton and wool textiles, machinery and jewelry industries.

The industrialization process was led by the cotton textile industry. The number of cotton mill spindles in the state climbed from 76,000 in 1815 to 500,000 in 1840 to 3 million by 1920. By the latter year, 35,000 people were employed in the cotton mills. The woolen textile industry also grew significantly--from 1,000 workers in 1840 to over 25,000 by 1920. Initially, growth of the textile industry depended on access to water for power and a ready supply of unemployed farm workers. The development of steam power and power looms, the building of large stone mills, and a massive and steady influx of work-hungry immigrants all propelled the state textile industry to its peak employment of over 70,000 workers in the early 20th century.

Hand in hand with growth in the textile industry in the late 19th century went increased concentration of mill ownership and harsher working conditions. The competition for profits led to the development and introduction of a series of production-boosting technologies. However, the utilization of these technologies led to overproduc-

tion, which in turn produced falling prices, meager profits and some staggering losses. Only the largest firms could meet the capital demands for newer machinery and ride out, or attempt to control through acquisition, the fluctuations of the market. In the attempt to be profitable in the production of standardized commodities, owners became obsessed with reducing costs. They assigned more machines to each worker, ran the machines faster and cut wages. Workers reacted to the increasingly intolerable conditions by unionization, strikes and work stoppages.

Rhode Island's machinery industry initially was established to produce equipment for the textile factories. In the second half of the 19th century, the industry developed to the point where Providence became the leading center of American industrial technology. The town boasted the nation's foremost producer of steam engines (Corliss) and machine tools (Browne and Sharpe). America's rush to industrialization meant a booming business for the state's machinery manufacturers. The first machinists' local in the state was formed in 1891.²

The jewelry and silverware industry got its start in Rhode Island in 1794. With the introduction of mechanized production equipment at the end of the 1800's, the industry was transformed from a craft to a mass production orientation. By 1910, Providence alone had nearly 300 jewelry firms and was the silverware capital of the country. With the spread of mass production, firm specialization took place--finding houses, refiners, and job shops specializing in electroplating, enameling, engraving casting and lapidary work appeared. In a pattern which has remained true through today, most of these companies were small because of the risks of heavy investment in expansion in an industry which was very sensitive to changes in fashion and fluctuations in the general economy.

The shift to mass production brought with it the de-skilling of traditional jewelry jobs, the fall of wage rates, job instability and increased hiring of women, who tended to be more willing than men to take such jobs. For a number of reasons, the

jewelry industry had very few labor unions. Firms tended to be small, often short-lived and required little capital investment to start. The women workers were generally more resigned to working conditions and money worries made them fearful of losing their jobs. These dynamics remain true today.³

The growth in Rhode Island manufacturing employment reached a halt at 153,500 in 1919. Half of the state's industrial employment was in the textile industry. In 1920, the textile industry began its 50-year move to the South, where it could enjoy lower labor costs and a more tractable workforce. The cotton mills were the first to go--by 1939, the state had lost two-thirds of its spindle capacity and cotton mill jobs. However, worsted mill employment was steady in the 1930's and jobs in synthetics actually grew significantly. The state's jewelry industry was hard hit by the Depression, as consumers could only afford low-cost items. By 1939, overall manufacturing employment was down to 125,000.⁴

The 1910's through the 1930's were a time of significant labor organizing and unrest in Rhode Island's textile industry. The Industrial Workers of the World instigated a wave of strikes among recent Italian immigrants in the textile industry in 1914-15. After the First World War, when textile mill owners increased the work hours and reduced wages, workers reacted by organizing new union locals and strikes. Facing job losses and wage cuts in the 1930's, textile workers both in Rhode Island and across the country went on an industry-wide United Textile Workers-led strike that resulted in several days of street riots. However, the thread that ties each of these episodes is that for the most part workers failed to reverse the industry trends imposed by the owners and economic conditions.⁵

The state's industrial base was reinvigorated by the demands of war production. Total plant employment jumped to 171,000 by 1943. All sectors of the industrial base were busy producing war materiel. Seventy percent of employment in production in the jewelry industry was devoted to war-related goods such as small radar and radio

parts, proximity fuses for motors and artillery shells, and small precision assemblies. The state's electrical and electronic components industry grew out of this conversion.

Manufacturing employment remained relatively strong immediately after the war, standing at 155,000 in 1947. Consistent with the past, the state's economy and industrial base were dominated by the textile industry, which employed 67,000 workers.⁶ The state's jewelry industry doubled in size between 1939 and 1947 in the face of booming consumer demand. With 20,000 workers, the state provided 44% of the country's jewelry jobs.

--The Legacies of the State's Core Industries at Mid-Century

In the first half of the 20th century, Rhode Island's textile, machinery and jewelry industries provided the state with a number of legacies. First, they helped spawn a number of other industries in the state. For instance, a significant wire and cable industry grew because the covering for most wire and cable was textile. When plastic sheaths replaced textile ones, a viable plastics industry developed. Skills learned in the jewelry and machinery industries encouraged the establishment of firms in fabricated metals--plating, valves and fittings, and hardware and cutlery--and in other jewelry-type work such as shoe and handbag ornaments and optical goods. The diversification of the plastics industry into custom molding also was stimulated by proximity to the jewelry industry. The spinning off of electrical components firms from the jewelry industry was noted above.

The second legacy of the textile and jewelry industries was a tradition of a manufacturing work force paid low wages, with low educational achievement, and with a higher-than-average representation of women, characteristics quite related to one another. With mill jobs readily available and requiring little training or education, Rhode Island workers typically left school at an early age. Employers offering low-wage, low-skilled jobs often sought women to fill them because women were more will-

ing than men to take such jobs. In 1950, 38% of the Rhode Island industrial workforce was comprised of women, compared to 25% for the U.S. Forty-three percent of textile workers and 60% of jewelry workers were women.⁷

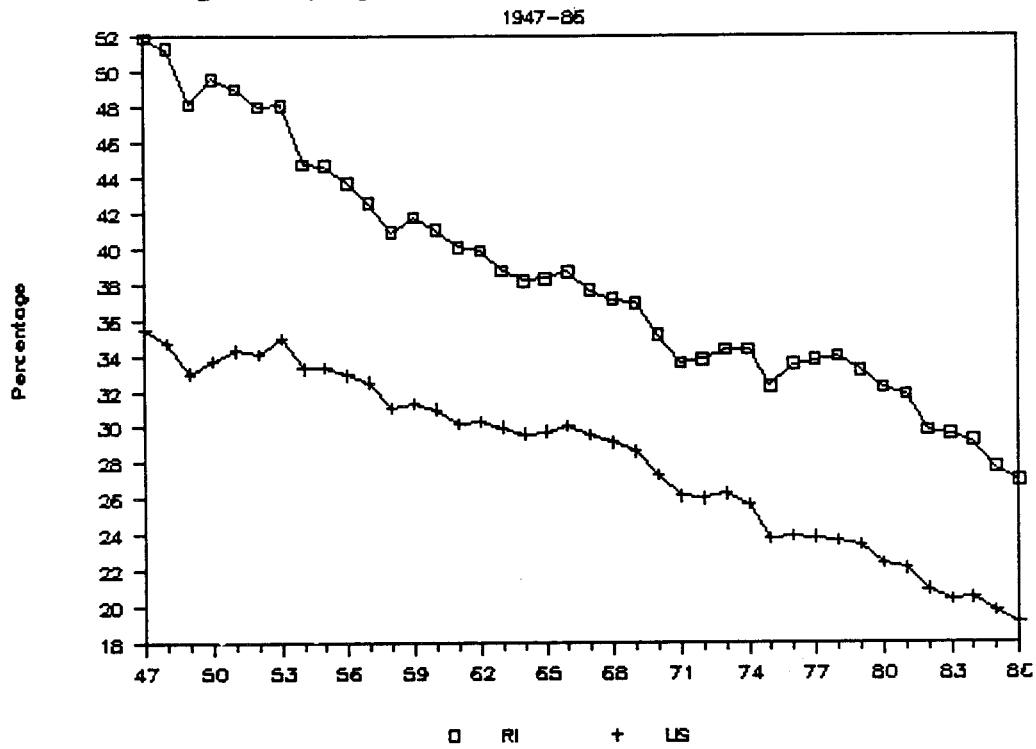
A third legacy of the state's textile and machinery industries was a tradition of a strong union presence in the state. In this heavily industrialized state, union strength translated itself to the ballot box. In the 1930's, the labor movement, the working class and the Democratic party created an alliance which ensured that the party governed the state for decades.⁸ The legislature itself periodically had a number of union members on its rolls.

Fourth, Rhode Island had developed a tradition of entrepreneurial activity. In the 1800's and early 1900's, some of the country's largest firms in textiles, machinery and rubber were headquartered in Rhode Island. By mid-century, many of them were gone, but there were still a very high number of small, locally-owned firms spread throughout Rhode Island's industries such as in specialized textiles, jewelry and machinery.

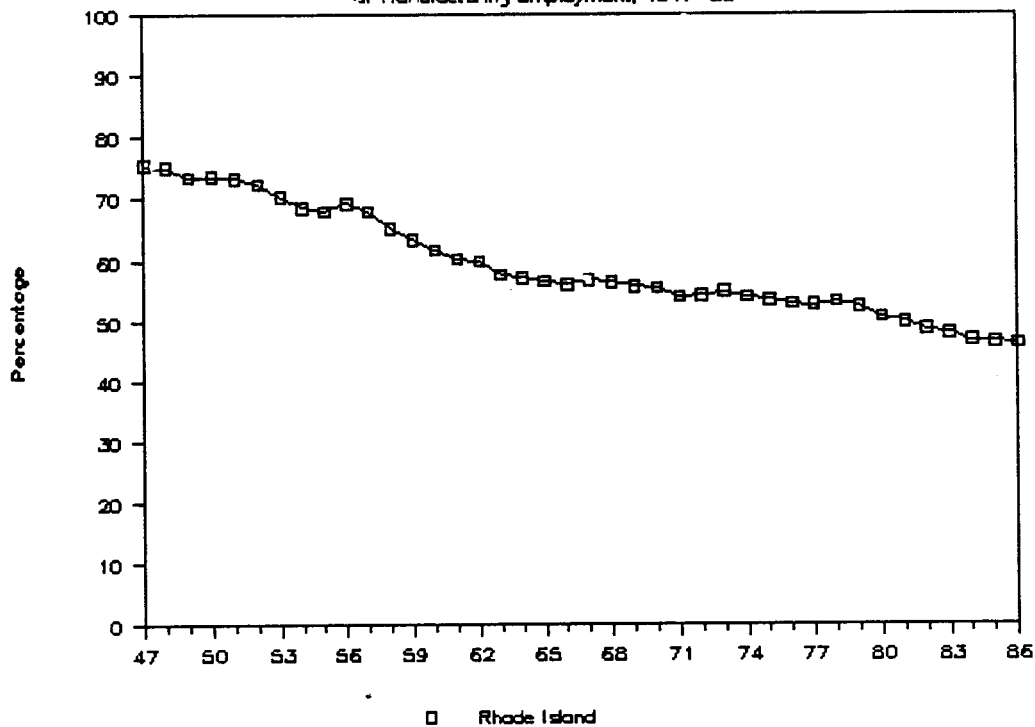
The final legacy of the state's major manufacturing industries was the economy's high vulnerability to structural shifts. In 1947, 52% of Rhode Island employment was in manufacturing, compared to 36% for the U.S. (See Figure 2.1.) Employment in the state's three major industry groups--textiles, metals and non-electrical machinery, and jewelry and silverware--accounted for 76% of all manufacturing jobs (compared to 32% for the U.S.).⁹ The state's textile industry employed 44% of all manufacturing workers and 23% of all workers. With such concentration, the state was enormously vulnerable to a restructuring of the textile industry, as it soon found out.

Figures 2.1 and 2.2

Mfg. Employment as % of Nonag. Employ.



Textile, Jewelry, M & M Employment as %
of Manufacturing Employment, 1947-86



Rhode Island Manufacturing Employment and Wages in the Postwar Period¹⁰

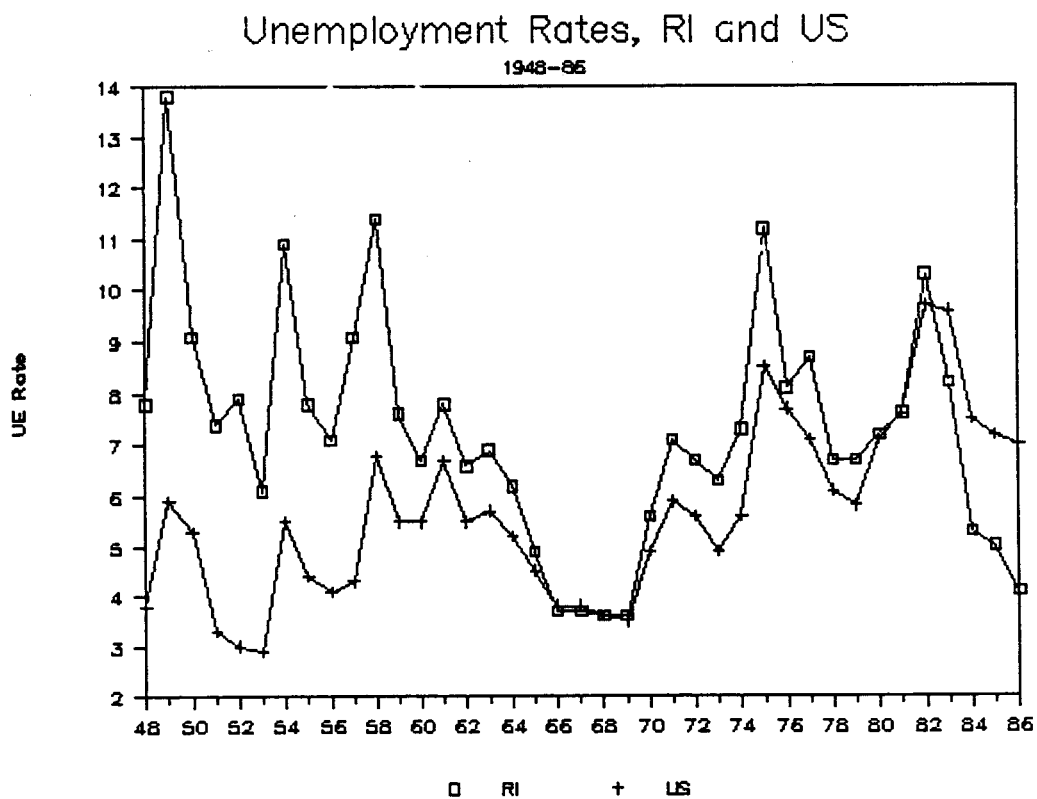
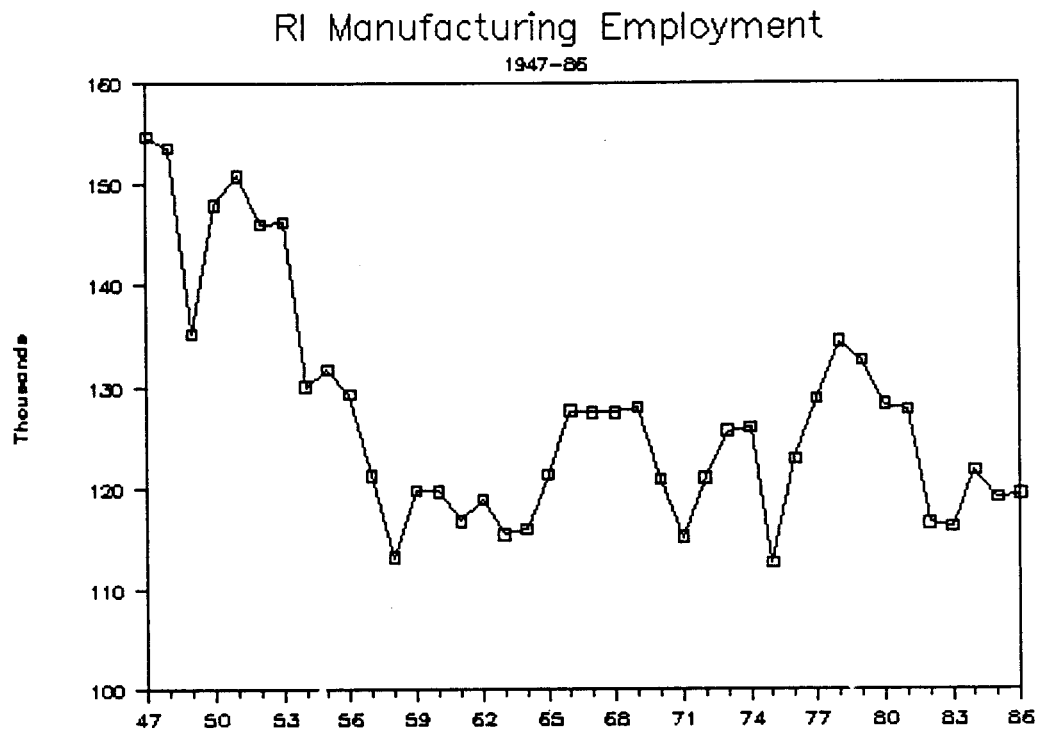
The postwar major trends in Rhode Island manufacturing employment and wages are consistent with its prior industrial history:

- o The manufacturing sector dominated the state economy to a far greater degree than for the U.S. as a whole (Figure 2.1);
- o the manufacturing sector itself continued to be dominated by textiles, jewelry and metals and machinery, though that dominance declined over time (Figure 2.2);
- o such dependence brought about large swings in aggregate manufacturing employment (Figure 2.3);
- o the cyclical sensitivity of manufacturing generally and high state dependence on manufacturing in general and a few industries in particular also brought about swings in unemployment rates more volatile than for the U.S. as a whole (Figure 2.4);
- o the manufacturing sector, dominated as it has been by textiles and jewelry, tends towards low-wage, low-skill jobs--RI manufacturing wages and value-added per worker are among the lowest in the country (Figures 2.5 and 2.6).

The remainder of this section looks at the manifestation of these themes in the 1947-78 period. The next section examines in greater detail RI manufacturing employment and wages in 1978-83, the focus period of this dissertation.

1947-1964: The Devastation of the Textile Industry. Between 1951 and 1958, Rhode Island manufacturing employment fell from 150,900 to 113,200, a plunge of 25%. The primary reason for this massive loss was the decimation of the textile industry, which lost 50% of its jobs (29,000) in the seven years, as operations either were liquidated or moved South. (See Figure 2.7.) These losses were almost entirely in wool textiles, whose market share was being seriously eroded by Southern-produced synthetic

Figures 2.3 and 2.4



Figures 2.5 and 2.6

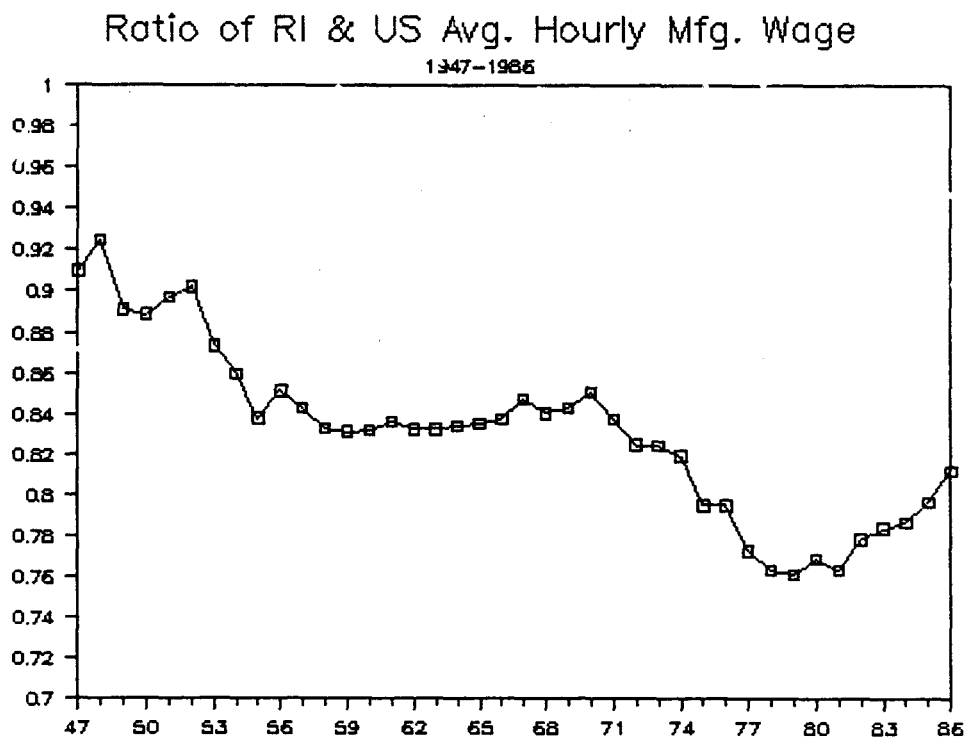
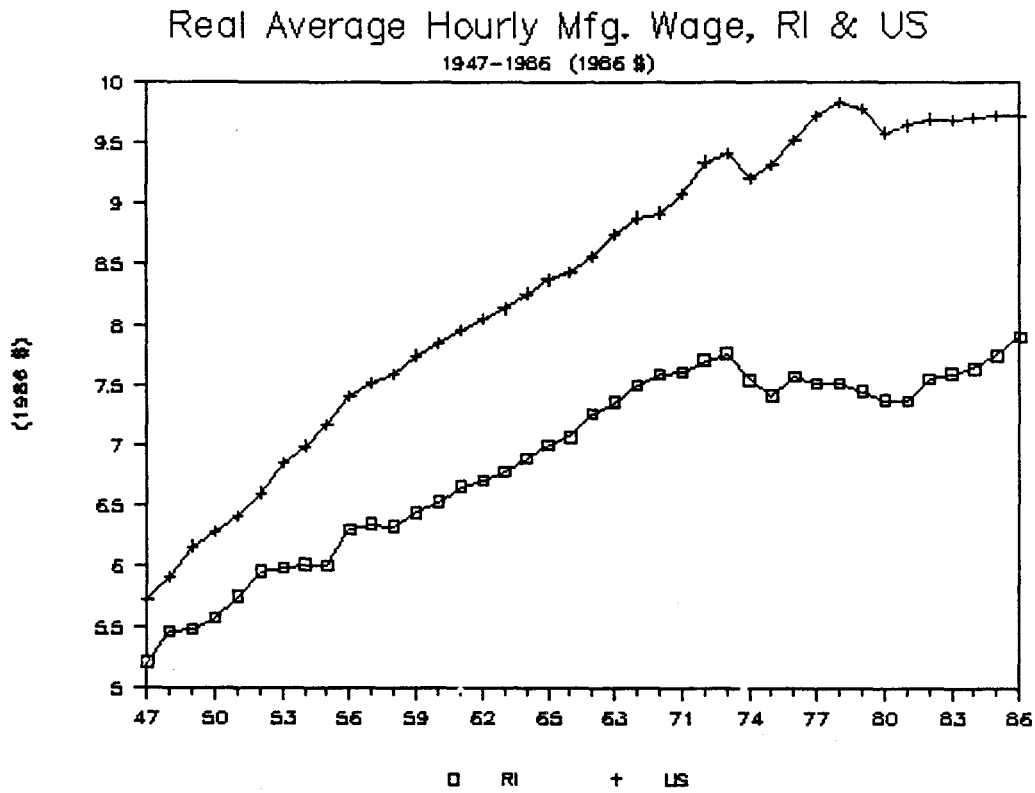


Figure 2.7



Sources for Figures 2.1-2.7: U.S. Bureau of Labor Statistics and the RI Department of Employment Security

products.¹¹ A steep decline also occurred in the machinery industry, which was centered in textile machinery. For the state, this was restructuring with a vengeance.

The state's dependence on textiles meant that throughout the late 1940's and 1950's it suffered an unemployment rate far above that for the U.S. as a whole. Moreover, the ups and downs in the movement of the rate were quite volatile, as Figure 2.4 shows. While the U.S. was feeling the negative economic effects of the end of Korean War, Rhode Island was experiencing that plus a one-year loss of 10,000 textile jobs (almost as many as are left in the state today.)

Rhode Island's real average hourly wage grew in the 1950's as it did elsewhere in the country, though at a far slower rate. In 1948, the state average wage was 93% of the U.S. average. In ten years, the figure had plummeted to 83%. The first reason for this drop is that textile wages, still the state's dominant industry, failed to keep up with wage growth in other sectors.¹² The second is that the state developed one of the most labor-intensive, low value-added industrial sectors in the country. In 1947, Rhode Island value-added per production worker was 83% of the U.S. figure; in 1958, the state figure was 68% of that for the U.S.¹³ This wage structure resulted from a combination of industry mix and pay that was less than for similar work elsewhere.¹⁴

From the late 1950's through the mid-1960's, overall manufacturing employment remained fairly stagnant. Textile employment continued to slide, with the losses made up by machinery, electrical goods, and increased diversification into such industries as chemicals, paper products and instruments. As the massive loss of textile jobs receded in time, the state unemployment rate fell close to the national figure.

1964-1969: Machinery- and Jewelry-Led Growth. As a result of several trends, state manufacturing employment grew by 10% from the mid- to late 1960's. First, the slide in textile employment stopped. Second, jobs in the growth industries of the previous period continued to be added--in machinery, electrical components, chemicals, and plastics. Third, additional growth came from jewelry-related firms. The dominant

force in the industrial sector became metals and machinery, which provided 23% of the manufacturing jobs in 1969. For the first time in decades, the state's unemployment rate not only fell below 4% and but also was at the same level as that for the U.S.¹⁵

1969-1975: Recessions. Between 1969 and the twin recessions of the early and mid-1970's, manufacturing employment fell 15% (compared to 9% for the U.S.). Employment in the textile industry again fell in half, from 21,100 to 11,800. Other losers included metals, machinery and rubber and plastics. In 1970, for the first time in the state's history, jewelry employment surpassed textile employment. Jewelry employment actually grew 20% between 1969 and 1975 on the strength of changes in fashion and the growth in the young adult market.

Once again, the state's economic woes were compounded by a dependence on manufacturing in general and on textiles and machinery in particular (textiles still had a 17% share of industrial employment in 1969). The state's unemployment rate jumped well above that for the U.S.--hitting 11.2% in 1975, compared to 8.5% for the U.S. Economic difficulties were exacerbated by the closing of the Quonset Naval Yard in 1971-4 period, which resulted in the loss of 22,000 jobs.

1975-1978: Jewelry-Led Boom. After steep job losses in 1971 and 1975, the state's manufacturing sector hit the up-side of the roller coaster between 1975 and 1978. The state's manufacturing employment jumped 19% to over 134,000, a level which had not been achieved since 1953. In comparison, the U.S. manufacturing employment rose 12% in the 3 years.

Fueling the increase was a one-third jump in jewelry employment. While fashion trends continued to favor the jewelry industry, employment also jumped because of the deregulation of gold. As the price of gold rose, so did consumer demand for both costume and precious jewelry, the former because it was affordable and the latter because it was seen as a good investment. Rhode Island jewelry-makers' orders also climbed with the entrance of several national sales companies into the jewelry retail

business. Even jewelry manufacturers with little business experience found business quite profitable.¹⁶

Almost all categories of industrial employment showed increases, even textiles. Besides jewelry, other significant sources of new employment included transportation equipment, a source of well-paying jobs, and electrical goods. The transportation jobs were provided primarily by General Dynamics, which started building submarines soon after the Navy pulled out of Quonset.

Even with the growth in industries across the board, the explosive growth in jewelry gave the state a new industry on which to be overly dependent. In 1978, 24.2% of all industrial jobs were in jewelry, compared to 15.8% in 1969. The growth in aggregate manufacturing employment in that decade was provided entirely by jewelry. (Total manufacturing employment was up 6,500, jewelry employment 12,000.)

Primarily as a result of the growth in the low-wage jewelry industry, the state's real average hourly manufacturing wage steadily declined through the 1970's. Nationally, the jewelry industry paid among the lowest wages in manufacturing--an average \$4.07/hr. in 1978, just 66% of the all-manufacturing average. The state's average manufacturing wage as a percentage of the U.S. average dropped to 76%.

1978-1983: Industrial Decline

--Overview of Trends in Employment and Wages

Employment. The manufacturing employment peak reached in 1978 could not be sustained. Again, the state felt the effects of a volatile manufacturing base. Between 1978 and 1983, the number of manufacturing jobs fell by over 18,000, a drop of 14% (compared to 10% for the U.S.). The worst year of net job loss was 1982, when employment declined by 11,100. During this period, the state's unemployment rate went from 6.7% to 10.3%, with most of the jump occurring in 1982.

The jewelry industry provided over half of the net job loss as its employment level plummeted by 9,600, a one-third drop. When jobs related to the jewelry industry were counted (e.g., in metal services, display boxes, and shoe buckles), total jewelry-related job loss was about 12,000, or two-thirds of the total net job loss. Machinery, textiles, leather, primary metals, and stone, clay and glass accounted for another 8,500 lost jobs. The only industry which managed gains was transportation equipment, on the strength of a single employer, General Dynamics.

Wages. Throughout the period, the state continued its tradition of having a low value added, low-wage industrial base. In 1983, Rhode Island's value added per production worker was 66% of the U.S. figure. The state ranked 50th of the 50 states both in value added per production worker and in capital expenditures per production worker.¹⁷ Rhode Island's 1979 average hourly wage of \$5.10 ranked 48th among all states, ahead only of Mississippi and North Carolina.¹⁸

Over the period, the average wage in 13 of 14 major RI industry groups was below the U.S. average, with the only exception being apparel. In fact, the majority of RI 2-digit industries paid wages that were less than 90% of those paid in these industries elsewhere in the country. For instance, in 1978, the state's manufacturing boom year, primary metals paid 67% of the national average, paper 70%, transportation equipment 74%, and fabricated metals 75%.

Given the state's traditional dependence on low-wage manufacturing, it is not surprising that the state's average annual pay for all wage and salary workers has been well below that for the U.S. The state's figure has remained at 87% of the U.S. figure since 1978.¹⁹

--The Structure of the Manufacturing Sector, 1978-83

In preparation for the next three chapters, this section provides a more disaggregated picture of Rhode Island's manufacturing industries in 1978 and the employment changes they experienced as of 1983. Table 2.1 provides a picture of Rhode Island manufacturing employment in 1978 and 1983 by 2-digit industry and across a number of dimensions--total employment, distribution of employment, employment change and percent employment change 1978-83, and location quotient. Table 2.2 provides similar information on selected 3- and 4-digit industries.

Overview. In 1978, the dominant industrial sectors in the state were jewelry, textiles, electrical goods, and fabricated metals. The state had some competitive advantage in 8 major industry groups (location quotient of over 1), particularly in jewelry and textiles, and was at a competitive disadvantage in 12 industry groups. The only industry in which the state had a significant national presence was jewelry, for which it had a 33% share of U.S. employment.

After the 14% employment decline between 1978 and 1983, the state's manufacturing base looked more diversified because of the large job loss in jewelry. Only the transportation equipment industry showed any significant job growth. Jewelry remained the largest industrial employer by far.

As Table 2.3 indicates, Rhode Island manufacturing workers were employed to a greater degree in small establishments than were manufacturing workers for the U.S. as a whole. Whereas one-quarter of U.S. workers were employed in plants of under 100 people, one-third of Rhode Island workers were. On the other hand, relatively few Rhode Islanders were employed in plants of over 1000 workers. These facts on the distribution of employment by establishment size will be important in interpreting the results of the next several chapters.

Jewelry and Jewelry-Related Industries.²⁰ In 1978, the jewelry industry and related industries--e.g., metal services, paperboard containers, signs and displays, shoe and

Table 2.1

RHODE ISLAND MANUFACTURING EMPLOYMENT BY MAJOR INDUSTRY GROUP
1978, 1983

Major Industry Group	1978	Employment (000's)		% Change	Location Quotient		Establishments	
		1983	Change		1978	1983	1978	1983
All Manufacturing	134.4	116.2	(18.2)	(14%)	1.44	1.45	3351	3071
Food	3.6	3.1	(0.5)	(14)	.46	.44	150	133
Textiles	12.6	10.9	(1.7)	(13)	3.07	3.38	220	188
Apparel	4.0	3.4	(0.6)	(15)	.66	.67	79	64
Lumber & Wood	0.5**	1.2**	0.7	140	.15	.42	50*	54*
Furniture & Fixtures	1.3*	1.3*	0.0	0	.58	.67	32*	32*
Paper Products	3.1	2.5	(0.6)	(19)	.97	.87	62	63
Printing & Publishing	5.1	5.7	0.6	12	.94	1.01	199	203
Chemicals	3.1	3.0	(0.1)	(3)	.62	.66	87	72
Rubber & Plastics	7.1	6.2	(0.9)	(13)	2.06	2.00	114	118
Leather	3.0*	1.5*	(1.5)	(50)	2.56	1.68	23*	18
Stone, Clay, Glass	3.1	2.0	(1.1)	(35)	.97	.81	59	48
Primary Metals	7.2	6.0	(1.2)	(17)	1.30	1.66	106	117
Fabricated Metals	10.0	9.2	(0.8)	(8)	1.31	1.54	402	397
Machinery	9.3	6.3	(3.0)	(32)	.88	.71	281	270
Electrical & Electronic	11.5	11.2	(0.3)	(3)	1.26	1.28	70	94
Trans. Equipment	6.2	8.9	2.7	44	.68	1.17	47*	52*
Instruments	5.3	4.6	(0.7)	(13)	1.78	1.53	64	71
Jewelry	32.5	22.9	(9.6)	(30)	72.42	69.95	1193	1039
Misc. Mfg.	5.7	5.3	(0.4)	(7)	3.53	4.12	233*	167*

Source: ES-790 tables, RI Dept. of Employment Security and U.S. Bureau of Labor Statistics, except as noted.

* U.S. Bureau of the Census, County Business Patterns

** U.S. Bureau of the Census, Census of Manufactures (1977, 1982)

Table 2.2

RHODE ISLAND EMPLOYMENT IN SELECTED MANUFACTURING INDUSTRIES
1978, 1983

Industry	Employment ('000's)				Establishments	
	1978	1983	Change	% Change	1978	1983
Textiles						
Wool Weaving	1.1	1.0+	n.a.	n.a.	16	12
Narrow Fabrics	3.1	2.4	(0.7)	(23%)	39	34
Knitting Mills	2.1	0.9	(1.2)	(57)	14	14
Textile Finishing	1.9	1.6	(0.3)	(16)	23	28
Yarn & Thread	1.7	0.8	(1.1)	(64)	19	17
Rubber & Plastics						
Rubber Products	1.9*	1.3*	(0.6)	(32)	15	19
Misc. Plastics	5.2*	4.9*	(0.3)	(6)	91	97
Primary Metals						
Nonferrous Rolling & Drawing	5.6	5.1	(0.5)	(9)	25	25
Blast Furnaces & Basic Steel	2.1	1.2	(0.9)	(43)	7	5
Fabricated Metals						
Screw Machine Products	1.4	1.2	(0.2)	(14)	49	45
Metal Forging & Stamping	1.1	1.2	0.1	9	34	45
Metals Services-- Plating, Polishing, Coating	3.8	2.5	(1.3)	(34)	163	154
Non-electrical Machinery						
Metalworking Machinery	4.9	3.3	(1.6)	(33)	108	95
Textile Machinery	1.4	0.7	(0.7)	(50)	22	21
Electrical and Electronic						
Lighting and Wiring	4.0	2.8	(1.2)	(30)	14	16
Communications Equipment	2.1 (est.)	2.5-3.0	0.4-0.9	19-43	5	10
Components and Accessories	1.9	1.9	0.0	0	23	30
Jewelry						
Precious Metal Jewelry	9.5	5.7 (est.)	(3.8)	(40)	244	211
Jewelers' Materials	5.9 (est.)	1.9	(4.0)	(68)	177	132
Costume Jewelry	16.1	11.5	(4.7)	(29)	278	276

Source: U.S. Bureau of the Census, County Business Patterns, except as noted.
Figures are for March.

* RI Department of Employment Security, ES-202 tables. Figures are annual averages.

Table 2.3

PERCENTAGE DISTRIBUTION OF EMPLOYMENT BY ESTABLISHMENT SIZE
RHODE ISLAND AND U.S., 1978 AND 1983

<u>Establishment Size Class</u>	<u>1978</u>		<u>1983</u>	
	<u>RI</u>	<u>US</u>	<u>RI</u>	<u>US</u>
1-19	9.5%	6.7%	10.0%	7.7%
20-49	11.8	8.7	13.1	9.6
50-99	12.0	9.9	13.1	10.7
100-249	19.9	17.7	19.5	18.4
250-499	15.8	15.3	16.0	15.2
500-999	15.9	13.7	14.3	12.8
1000+	15.1	28.0	14.0	25.5

Source: U.S. Bureau of the Census, County Business Patterns

handbag buckles, and watch cases--employed approximately 40,000 workers, 30% of the manufacturing workforce. The heart of the jewelry industry was costume jewelry, which employed over 16,000 workers. In 1978, Rhode Island employed nearly 60% of U.S. costume jewelry workers. Other jewelry industries with significant presence included precious metal jewelry and jewelry findings (component jewelry pieces such as earposts and decorations). The state's share of U.S. employment in these other two industries also was high, 23% and 56% respectively. The share of precious jewelry employment was lower than the others primarily because the jobs in that industry are of a higher skill and Rhode Island's competitive advantage in jewelry has been low-wage, lower-skilled labor.

Between 1978 and 1983, the number of jewelry establishments dropped from 699 to 619. Employment in the jewelry industry and related fields dropped approximately 12,000, which accounted for two-thirds of the total net employment loss in manufacturing. Much of the jewelry loss occurred because of industry sensitivity to declining personal income, changing tastes, mismanagement (as we will see) and import penetration, particularly for precious jewelry²¹

As mentioned earlier, the jewelry industry is comprised primarily of small establishments, because changes in fashions and sensitivity to economic conditions make large-scale investment very risky. About 80% of Rhode Island's jewelry plants have less than 50 workers.

Textiles. After the massive reduction in textile employment between 1947 and 1978, the firms that remained generally produced short-run, specialty items that required a higher mix of skilled labor than the commodity-type products produced elsewhere.²² In order of importance, textile employment in Rhode Island in 1978 was concentrated primarily in narrow fabrics (i.e., elastic fabrics and braided fabrics), knitting mills, textile finishing, and yarn and thread. The state still had some comparative advantage in textiles in 1978--its location quotient was 3.1. Between 1978 and 1983, state

textile employment dropped by 1,700, the third biggest loss after jewelry and machinery.

Machinery. In 1978, most of the state's 9,300 machinery workers were located in the metalworking machinery industry (particularly at Browne and Sharpe) and in the textile machinery industry (despite the fact that the latter industry was less than a tenth of its size in 1951). The state still produced over 5% of the country's textile machinery. By 1983, machinery employment had fallen to 6,300 (down 30%). The losses were primarily a result of a long-term strike at Browne and Sharpe, depressed demand in machine tools, and the elimination of half of the remaining textile machinery employment.

Primary metals. In 1978, the bulk of the state's primary metals employment (7,200) was in nonferrous wire drawing and insulating (over 5,000), with the remainder mostly in blast furnaces and basic steel. While employment in wire and cable fell slightly, employment in blast furnaces and basic steel was cut almost in half. Employment in 1983 for the primary metals group was 6,000. Major wire and cable employers included Carol Cable (bought a few years ago from Avnet), Leviton and Kaiser Aluminum.

Electric and Electronic Equipment. In 1978, employment in the electrical goods industry was located primarily in electric lighting and wiring, communications equipment and electric components and accessories. Employment in the latter group actually grew between 1978 and 1983. The only 3-digit electrical industry to suffer major job losses was electric lighting and wiring, as a result of General Electric's relocation of two wiring device operations to Mexico. The largest employer in communications equipment was Raytheon.

Rubber and Plastics. In 1978, the rubber and plastics firms employed 7,100 people, primarily in making miscellaneous plastics products. Even so, most of the 900 lost jobs came from the rubber sector, many from the failure of a canvas shoe

manufacturer. The largest plastics employer in the state is Tupperware, a division of Dart Industries.

Other Industries and Employers. Rhode Island had manufacturing employment in a number of other industries, many of which were dominated by one or several employers. The largest employer in the food processing industry was Narragansett Brewery, a unionized plant owned by Falstaff Beer, and shut down in 1981. While General Dynamics provided a near majority of the jobs in transportation, Fram auto filters also had a sizeable number. In the apparel industry, Health-Tex, a maker of children's clothes, was the dominant employer. Most of the other establishments in the industry were job shops. American Tourister Luggage provided nearly half the jobs in the leather industry category (even though few suitcases are made out of leather these days). While miscellaneous manufacturing had many small employers with product lines such as Christmas ornaments and artificial flowers, a large percentage of the employment was provided by two big employers--A.T. Cross (pens) and Hasbro (toys and games).

1983-1986: Industrial Stagnation and the Growth of the Service-Producing Sector

After previous manufacturing recessions, the state's industrial sector typically has shown significant job growth. However, manufacturing employment has been fairly flat since 1983. Today, the jobs level is at 119,000, only 3% above the nadir of 1983. The U.S. manufacturing sector as a whole has experienced the same trend.

However, since 1983 and for the first time in recent history, the state's unemployment rate has moved appreciably below that for the U.S. In 1986, the state's unemployment rate was 4.1%, compared to 7.0% for the U.S. This achievement was made possible by a 17% increase in non-manufacturing employment in three years (from 275,000 to 323,000) that outpaced the growth in the labor force. The largest gainers were services and retail trade. The state now appears to be attracting a number of

backoffice clerical operations in the finance and insurance industries.²³ To the extent this is so, these jobs may be simply a cleaner form of the low-wage jewelry jobs they are replacing.

With the growth in service production, the state's reliance on manufacturing has continued to fall. In 1986, manufacturing contributed 27% of the state employment, compared to 34% in 1978. The traditional heart and soul of the state's industrial base--textiles, jewelry and machinery--has fallen in size to such an extent that the state manufacturing sector by default is more diversified than ever before. Textiles, jewelry, and metals and machinery now comprise 46% of all manufacturing employment, compared to 76% in 1947.

In many areas of the country, the substitution of service-producing jobs for goods-producing jobs has meant substantial losses of income for laid-off workers. However, because of Rhode Island's low factory wages, and particularly because half of the layoffs came in the very low-wage jewelry industry, the pay differential between many Rhode Island manufacturing and service jobs is much less, though still negative. The average annual pay per RI manufacturing worker was 15% above the annual average pay of other workers in the state, compared to 29% for the U.S.²⁴ Moreover, the 1981 average hourly jewelry wage (\$5.07 in current dollars) was 17% below even Rhode Island's low all-manufacturing wage. Average service sector pay was 25% below average manufacturing pay. Hence, if a laid-off jewelry worker could find another job, it was likely that she would still suffer an income loss, but relatively less than elsewhere.

CHAPTER NOTES

¹Information and data in this section is drawn from Rhode Island Strategic Development Commission, op.cit., unless otherwise noted.

²Edwin C. Brown, "Working Early in Rhode Island" (Providence: Rhode Island State Labor Council, July 1982), p.18.

³Paul Buhle, Scott Molloy, and Gail Sansbury (eds.), A History of Rhode Island Working People (Providence: Regine Printing, 1983), p. 72.

⁴U.S. Bureau of Labor Statistics, Employment, Hours and Earnings, States and Areas, 1939-82, Bulletin 1370-17 (Washington, DC: Government Printing Office, January 1984). Remaining Rhode Island manufacturing employment figures in this section are from this source, unless otherwise noted. U.S. figures are taken from U.S. Bureau of Labor Statistics, Employment, Hours, and Earnings, United States, 1909-84, Volume I, Bulletin 1312-12 (Washington, DC: Government Printing Office, March 1985).

⁵Buhle, Molloy, Sansbury, op.cit., pp. 50-52.

⁶Rhode Island Department of Employment Security, unpublished ES-790 tables.

⁷U.S. Bureau of the Census, 1950 Census of Population.

⁸Buhle, Molloy, and Sansbury (eds.), op.cit. p. 52.

⁹RI figure from ES-790 estimates.

¹⁰Unless otherwise noted, all state employment and wage figures are derived from RI Department of Employment Security ES-790 data (unpublished tables) and all U.S. figures from U.S. Bureau of Labor Statistics Employment, Hours, and Earnings (Bulletin 1312-12). Unemployment rates are taken from unpublished state tables and the U.S. Bureau of Labor Statistics' Handbook of Labor Statistics, Bulletin 2217 (Washington, DC: Government Printing Office, June 1985).

¹¹Rhode Island Strategic Development Commission, op.cit., p. 185.

¹²The U.S. average hourly wage for textile workers was 95% of the U.S. all-manufacturing wage in 1948, but only 71% of the all-manufacturing figure in 1958.

¹³U.S. Bureau of the Census, Census of Manufactures, 1947 and 1958.

¹⁴Rhode Island Strategic Development Commission, op.cit., p. 47.

¹⁵Rhode Island's labor force participation rate, both in 1970 and historically, was above that for the U.S. The LFPR for women has been particularly higher (e.g., 44% v. 40% in 1970).

¹⁶Rhode Island Strategic Development Commission, op.cit., p. 199.

¹⁷U.S. Bureau of the Census, State and Metropolitan Area Data Book, 1986

(Washington, D.C.: Government Printing Office, 1986), p. xxxii.

¹⁸Figure 2.6 shows a rise after 1979 in the Rhode Island average wage as a percent of the U.S. figure. This rise is primarily the result of the loss of the low-paying jewelry jobs, not noticeable improvement in wage conditions in other industries.

¹⁹U.S. Bureau of Labor Statistics, annual news releases on annual average pay for states and areas.

²⁰All statistics regarding specific industries within major industry groups are gathered from U.S. Bureau of the Census, County Business Patterns: Rhode Island, selected years.

²¹Rhode Island Strategic Development Commission, op.cit. and U.S. Department of Commerce, 1987 U.S. Industrial Outlook (Washington, DC: Government Printing Office, January 1987). Surprisingly, imports share of costume jewelry was relatively stable in the period (17%), though it has risen significantly since then (31% in 1985).

²²Rhode Island Strategic Development Commission, op.cit., p. 185.

²³New York Times, "Providence Striving to Join the Boom by Luring Business From Elsewhere," March 29, 1987

²⁴U.S. Bureau of Labor Statistics, "Average Annual Pay by State and Industry," News Release USDL 82-460, December 12, 1982.

CHAPTER 3

ANALYSIS OF GROSS JOB FLOWS RHODE ISLAND, 1978-83

Introduction

The debates over the causes of economic dislocation and the public programs needed to ameliorate dislocation are hampered by a fundamental lack of information regarding the sources of employment change. Measuring the net change in aggregate employment, even in 4-digit industries, does not allow us to see the roles of firm and plant births, expansions, deaths and contractions in employment change. Little is known about the percentage of jobs which are actually eliminated each year, the percentage of job loss due to plant closures, and the percentage of contraction job losses which are not temporary. But without accurate knowledge of the sources of employment change, it is difficult to fully understand the nature and extent of the economic problems faced and to design programs that can meet those problems.

As one attempt to deal with this lack of information, in this chapter I disaggregate change in Rhode Island manufacturing employment for the 1978-83 period into by the extent and source of job change at the plant level. I am calling this effort a gross job flows analysis. Gross job gains are those jobs added by expanding and new plants; gross job losses are jobs eliminated as the result of plant contractions and closures.¹ Specifically, the chapter will look at:

- o gross job losses and gains over the period as a whole and annually,
- o the number of lost jobs attributable to plant closings and to plant contractions,
- o the number of jobs lost in contracting plants in one year that are recovered by those plants in the next, and
- o patterns in annual job loss and gain as the recession deepened.

In addition, I compare the methodology and findings of this chapter to those of other studies which have attempted to measure gross job flows. In light of the Rhode Island findings, I then offer a series of generalizations regarding gross flow trends that might be tested through further study.

Methodology

--Collection of Employment Data

I obtained the data for the gross flow and regression analyses from the ES-202 files of the Rhode Island Department of Employment Security (DES).² The ES-202 files are prepared from the quarterly unemployment insurance (UI) reports that must be filed by nearly every employer in the state. DES made the employment data available to me in the form of computer printouts, which also included firm name, address and plant SIC code. Our agreement was that I would handcopy the data--DES was not willing to let data tapes or the printouts leave the premises.

Given the necessity of copying the data, I had to design constraints on the data collection process so that I had enough data for meaningful analysis, but not so much that I would be overwhelmed in the data collection effort. Consequently, I decided I would look at all establishments with 50 or more employees. This choice provided good employment coverage, and kept the number of establishments at a manageable level for data collection, yet high enough for statistical analysis. Plants with 50 or more employees provided 77% of the state's manufacturing employment, but comprised only 15% of all establishments.

A consequence for the gross flows analysis of choosing a minimum plant size is that it is not meaningful to measure the contribution of plant births to job creation. I track job change in a cohort of plants (those with 50 or more in a base year)--there is exit from the cohort but no entry. The consequence for the logit regression analysis (Chapter 4) is that I cannot ascertain relationships between organizational character-

istics and plant closings for small plants and new firms. Most of the firms I examine are fairly established. As I discuss my various research findings, I will point out the implications of not having data on the smallest establishments.

I asked DES for a computer printout of employment data for establishments with 50 or more employees for June and December of each year between 1977 and 1983. Nineteen seventy-seven was the base year simply because that was the first year for which DES had put UI account data on computer. At the time of the request for data, 1983 was the most recent full calendar year for which data were available. For accounts which had more than fifty employees at some observation points but less than 50 in others, I obtained the missing data from DES microfiche files.

--Decision Rules Regarding the Population

I refined the raw data base in a number of ways in order to prepare both for the gross flows and the regression analyses. First, I decided that newspaper publishers, though technically in manufacturing, would be excluded from the population because they were linked almost entirely to local markets, i.e. they were not in the traded sector or closely linked to firms that were.

Second, I took steps to ensure that the data base was truly longitudinal. UI files are structured by account, not by firm or plant. Accounts may be initiated or terminated for reasons other than firm/establishment birth or death, e.g., change in ownership or change in legal structure from a division to a subsidiary. The DES computer data base provides no information on consecutive account numbers that represent one plant. Consequently, I needed to link accounts by hand in order to remove spurious births and deaths. Linkage was obvious in many cases in which two accounts had the same firm name and one terminated at the observation point just previous to the one in which the other began. Accounts that began after June 1977 or ended before December 1983 and that could not be so linked were considered as potential births

and deaths. Confirmation of births and deaths was made through the telephone survey undertaken to collect the organizational characteristics and, for non-respondents, review of Rhode Island manufacturing directories and talks with persons knowledgeable about corporate histories.

Third, I decided to exclude plants which only briefly provided 50 or more jobs. In order for me to include a plant in the study population, it needed to have 50 or more employees for three consecutive observations (e.g., June-December-June). I thought that this approach offered the best available proxy for one year's steady employment of 50 or more employees. As a result of all these various population decision rules, the data base population was comprised of 583 manufacturing establishments, representing 550 firms.

--Measuring Plant Employment

Regarding the measurement of each plant's employment for the purposes of the gross flows and regression analyses, I had to address two issues. First, I needed to decide whether to measure employment and employment changes in each year using only one observation point (June or December), the average of June and December, or the average of December-June-December. Second, I needed procedural rules for filling in missing employment data.

I thought that a gross flows analysis should be point-to-point, not an annual average-to-annual average, because the former is a better measure of actual change in job levels. However, true point-to-point (e.g., June-to-June) might incorporate job levels that were very transient in nature, for instance if a crew of temporary help was taken on to deal with an temporary overflow of orders. Consequently, I decided that the average of each plant's June and December figures for a given year would be the measure of that year's employment. This approach would correct for problems of seasonality, in that the same months would be used each year, and would smooth out

transient rises and falls. A December-June-December average did not seem appealing because, first, it essentially was a rolling average, as each December figure would be used in determining the figures for two years, and as such would smooth out year-to-year variation too much; and second, because one December figure would actually not be in the actual year of concern.

For companies with more than one plant in Rhode Island, the UI account contained estimated rather than actual employment figures for each plant. Every company reporting to DES provides only a total employment figure of all workers covered by the UI account, regardless of the number of plants involved. For multi-plant accounts, DES prorates the total employment figure among the individual plants according to the plants' actual share of employment as reported in a triennial survey to gather information on types of products manufactured.³ Consequently, the employment figures for all plants in an account rise and fall in unison, and so can be considered as only estimates for actual plant figures. In several instances, DES continued to allocate employment to a plant which I knew through the telephone survey to have closed; in these cases, I reallocated the employment in the closed plant to the ones that remained open.

In a number of instances, the DES data base did not have an employment figure for every observation point for which a plant was in operation. First, DES did not estimate employment among plants in most multi-plant accounts until 1979. Prior to that year, usually only an employment figure for the account as a whole was provided. For the plants without 1977-78 employment estimates, I used the 1979 proration formula to distribute the 1977-78 account employment total among the plants.

Second, a few firms did not report their employment figure for a particular month. Normally, DES follows up with a phone call to get the data, but this is not always done. Third, DES microfiche records were not available for June and December, 1977 and June, 1981. Consequently, accurate employment counts could not be obtained for plants which met the criteria for inclusion in the data base but did not have 50 or

more people in one of those months. In these instances, the missing value was determined by interpolation, extrapolation or other estimating methods.⁴

Gross Job Flows for the Manufacturing Base, 1978-83

For the analysis of gross job flows, I decided that the appropriate time frame for study was 1978 to 1983, covering one end of the decline in manufacturing employment to the other. I carried out the gross flow analyses for the period as a whole and on a year-to-year basis. As mentioned earlier, I used a cohort approach, in which I defined a population of plants in the base year and then measured the extent of job change due to expansion, contraction and closure. The use of a cohort approach meant that the entry (births) of new plants could not be included.⁵

For the analysis of gross flows for the period as a whole, I limited the population to those plants that had fifty or more employees in 1978. Including plants with less than 50 employees in 1978 but which later grew, while excluding smaller plants which did not grow, would have biased the analysis in favor of expansions. The 1978 cohort is comprised of 511 manufacturing establishments of 50 or more employees. These plants had 103,970 employees in 1978, which was 77% of total covered employment in manufacturing (less newspaper publishing) and represented approximately 15% of the manufacturing establishments reporting to DES.⁶

A year-to-year analysis is first done for the 1978 cohort. Then, for purposes of contrast, a year-to-year analysis is carried out in which employment change is measured for all plants with 50 or more employees in the t-1 year (e.g., 1981 gross flows are measured for all 1980 plants with 50 or more). This has the effect of removing plants which fall below 50 and adding plants which were below 50 in 1978 but have grown.

--Job Gain and Loss between 1978 and 1983

Cohort Net Job Loss in Relation to the Whole. In the aggregate, the subject group of plants lost a net 20.7 thousand jobs by 1983, a decline of 19.9%. This figure compares to a net drop of 18.4 thousand jobs in manufacturing overall (a 13.6% fall). As Table 3.1 shows, the difference between the two figures is primarily a function of employment gains in a handful of plants which in 1978 either had less than 50 employees or were nonexistent and which grew to have 50 or more employees in 1983. The net change in the residual group (those plants which in 1978 either had less than 50 employees or were nonexistent and which in 1983 had less than 50 employees) was slightly negative.⁷

The figures in the table indicate several interesting patterns. First, not surprisingly, the aggregate net loss in manufacturing employment was almost entirely a function of the job loss in the large plants (those with 50 or more) existing in 1978. This is consistent with the finding in the previous chapter that between 1978 and 1983 the share of manufacturing employment in plants of under 50 rose from 21.3% to 23.1%. Second, whether through attraction or internal development, very few large plants opened in Rhode Island during this period. Between 1979 and 1982, only 10 new plants were established which had 50 or more employees in 1983. Of these 10, seven were branch plants. Only three were local startups and they provided but 227 of the new plant jobs (13%). Two of the 10 plants, both in shipbuilding, provided 60% of the new plant jobs.⁸

Third, contrary to the popular idea that small firms are the primary generators of new jobs, less than 2% of the 1978 small plants (44 of 2819) had 50 employees by 1983. In contrast, 9% of the 1978 large plants (44 of 511) created 50 or more new jobs by 1983 (Table 3.2). While these growing small plants created 1,537 jobs by 1983, large plants which expanded by 50 or more as of 1983 created 6,988 jobs.

TABLE 3.1

NET CHANGE IN RHODE ISLAND MANUFACTURING
EMPLOYMENT, 1978-83
BY PLANT STATUS IN 1978

	# establishments		Employment			
	1978	1983	1978	1983	Change	% Change
All manufacturing*	3330	3050	134,610	116,252	(18,358)	(13.6%)

Plants in data base:						
Plants with 50+ employ. in 1978	511	458	103,970	83,250	(20,720)	(19.9)
Plants opened after 1978 and w/ 50+ employ. in 1983	0	10	0	1,727	1,727	-
Plants w/ <50 in 1978 and w/ 50+ in 1983	44	44	1,588	3,125	1,537	96.8

Residual plants:						
1) plants w/ <50 in 1978 & <50 in 1983 and 2) plants opened after 1978 & w/ <50 in 1983	2775	2538	29,052	28,150	(902)	

* excluding newspaper publishing

Source: ES-202 data

Note: All mfg. establishment totals are annual averages.

Gross Job Flows for Cohort Plants, 1978-83. The gross job flows for the plants which had 50 or more workers in 1978 are presented in Table 3.2. The table indicates the existence of a degree of employment change at the plant level that can not be seen simply by looking at net change in aggregate employment figures. The key results are as follows:

- o Over 28% of all jobs that existed in plants with 50 or more employees in 1978 were gone by 1983. Thirty-seven percent of the lost jobs were the result of plant closures.
- o Seventy percent of all plants had either had closed or contracted between 1978 and 1983--14% were closures, 56% were contractions.
- o Thirty percent of the plants had expanded between 1978 and 1983. These 153 plants created nearly 9000 jobs, or 9% of the 1978 base.
- o For the most part, the gross job gains and losses were the result of substantial additions and subtractions to plant workforces. Eighty-one percent of the job loss due to major layoffs in open plants was contributed by plants which lost 50 or more workers. Similarly, 78% of job growth in expanding plants was contributed by plants which gained 50 or more workers.

--Annual Gross Job Losses and Gains, 1978-83

1978 Cohort Plants. An even richer view of gross job flows can be obtained by looking at them on an annual basis (Table 3.3). We can see the relationship between shifts in annual job change and the movement of the business cycle and the amount of "churning" that goes on at the plant level, e.g., job loss in one year made up by job gain in the next. First I will look at patterns indicated by the table regarding job loss, then job gain, then loss and gain together.

Major patterns regarding gross job losses include the following:

Table 3.2

EMPLOYMENT CHANGE 1978-83
RHODE ISLAND PLANTS WITH 50+ EMPLOYEES IN 1978

	N	1978 emp.	1983 emp.	change
All Plants	511	103,970	83,250	(20,720)
<hr/>				
	Plants N	%	Emp. change 1978-83	% 1978 emp.
Plants with job loss	358	70.1%	(29,675)	28.5%
Closed plants	71	13.9	(10,851)	10.4
Open plants	287	56.2	(18,824)	18.1
losing 100+	49	9.4	(11,082)	10.7
50-99	61	11.9	(4,130)	4.0
15-49	109	21.7	(3,114)	3.0
1-14	68	13.3	(499)	0.5
Plants with job gain	153	29.9	8,955	8.6
Gaining 100+	19	3.7	5,185	5.0
50-99	25	4.9	1,803	1.7
15-49	57	11.1	1,615	1.5
0-14	52	10.2	353	0.3

Source: ES-202 data

TABLE 3.3

ANNUAL GROSS JOB GAIN AND LOSS, 1978-83
Plants with 50 or more employees in 1978

	78-79	79-80	80-81	81-82	82-83
First Year Employment	103,970	102,482	97,314	92,975	83,872
net % change	(1.4%)	(5.0%)	(4.5%)	(9.8%)	(0.7%)
First Year Establish.	511	505	499	487	474
Net % Change--All Mfg.	(1.3%)	(3.3%)	(0.4%)	(8.7%)	(0.2%)

Gross Job Loss	(7,307)	(9,753)	(8,745)	(11,611)	(6,833)
Contractions	(6,167)	(8,132)	(6,687)	(8,458)	n.a.**
Closures*	(1,140)	(1,621)	(2,058)	(3,153)	n.a.**
% gross loss	15.6%	16.6%	23.5%	27.2%	n.a.**
% of First-Year Emp.	7.0%	9.5%	9.0%	12.5%	8.1%
contractions	5.9	7.9	6.9	9.1	n.a.
closures	1.1	1.6	2.1	3.4	n.a.
Largest Contraction	(788)	(229)	(818)	(269)	
Largest Closure	(194)	(560)	(250)	(474)	
Contraction Job Loss					
Recovered in Next Year	964	1,766	802	2,171	
% contraction job loss	13.6%	21.7%	12.0%	25.7%	
% gross job loss	13.2	18.1	9.2	18.7	
% of contracting est.	30.4	43.2	25.7	47.2	
which expand next yr.					
Gross Job Gain	5,819	4,585	4,425	2,508	6,211
% of First-Year Emp.	5.6%	4.5%	4.5%	2.7%	7.4%
Largest Gain	198	1,029	133	171	833
Recovered Jobs as % of Gain	--	21.0	40.1	32.0	35.0

Ratios					
Losing/Expanding Plants	.94	1.69	1.19	2.55	.97
Lost/Gained Jobs	1.26	2.13	1.99	4.63	1.10
Contracting/Exp. Plants	.87	1.55	1.04	2.23	n.a.
Lost Jobs in Contracting	1.06	1.77	1.52	3.35	n.a.
Plants/Gained Jobs					

* Plants considered closed are those which essentially stopped manufacturing operations in either year of the two-year period or the subsequent year. For instance, the 1979-80 plant closing job loss figures include plants that closed in 1978, 1979 or 1980. Since I did not have an accurate list of 1984 closures, figures on closures and contractions for 1982-83 were not available.

** Minimum plant closing job loss figure for 1982-83 is 1,676; maximum contraction job loss figure is 5,156. Plant closure job loss is at least 24.5% of gross job loss.

- o A significant number of jobs disappeared each year through plant closings and contractions. At least 7% of the manufacturing jobs disappeared from one year to the next; in four of the five years, the gross loss was over 8%. The worst yearly loss was in 1982, when 12.5% of the jobs in 1981 (one in eight) were eliminated.
- o Even in the worst of years, contractions were a much more important source of job loss than were plant closings. In 1979, 84.4% of gross job losses were due to contractions. In the worst year of job loss, 1982, contractions accounted for 72.3%.
- o The number of jobs lost to plant closings climbed, on a relative basis, much more quickly than job loss due to contractions. The number of jobs lost to plant closings in 1982 was three times the loss in 1979. Job loss due to contractions did not climb each year (it fell in 1981) and was one-third higher in 1982 than in 1979.
- o Thus, the percentage of gross job losses attributable to plant closings consistently increased every year. In 1979, 15.6% of gross losses were due to plant closings. In the next three years, the figure successively climbed to 16.6%, 23.5% and 27.7%. (On the basis of partial information, it seems likely that the 1983 percentage equals or surpasses that for 1982.)
- o As the recession bottomed out, the level of gross job losses dropped precipitously. The 1983 figure was the lowest of the five years.
- o A significant number of the jobs lost through plant contractions were recovered by those plants in the succeeding year.⁹ Even in 1982, 12% of the jobs lost through contraction in 1981 were recovered. The best year for job recovery was 1983 (25.7% of 1982 contraction job loss), as the slide in net job loss essentially halted and gross job gains jumped. As a percentage of gross job losses as a whole (i.e. including losses due to closures), jobs recovered in

the succeeding year twice were above 18%. Hence, we see that a significant amount of "churning" in employment goes on in individual plants.

In Table 3.2, we saw that by 1983, 37% of the cumulative job loss came from plants that had closed. Yet on an annual basis the percentage of job loss due to closure varied between 16% and 27%. This difference is the result of two factors. First, while the cumulative table attributes to plant closure all job losses in a closed plant, the annual table counts as plant closure losses only jobs lost in the year of and the prior year to closure. Job losses in closed plants that occurred more than a year prior to closure are counted as contractions in the annual table. Second, if a plant's employment in 1983 was higher than in 1978, the cumulative table just sees this as an expansion, while the annual table picks up any contractions that may have occurred in the intervening years. The inclusion of these contractions lowers the proportion of annual job loss due to plant closures relative to that in the cumulative table.

In light of the finding that plant closures do not provide the majority of job loss, I should point out that plant closures would seem to represent a higher level of economic dislocation than do contractions. We saw that a significant number of jobs lost through contractions in one year are recovered in the same plant in the next. Even though we do not know the percentage of "recovered" jobs filled by the workers laid off the previous year, we do know that there are no recovered jobs in the closed plants.¹⁰ Moreover, it is reasonable to expect that a higher percentage of contraction job loss is the result of attrition (retirement, switching to a better job, voluntarily leaving the labor force) than would be the case in plant closures.

Despite the recession, job gains continued to occur in a substantial number of plants, though gains did decrease as the recession wore on. Moreover, a good part of job gains in any year were the "recovery" of jobs lost in the same plant the prior year

as the result of contraction. Specific patterns regarding gross job gains due to expansions include the following:

- o Visible gross job gains occurred each year but, given the economic downturn, not at the level of the gross job losses. The number of new jobs in expanding plants as a percentage of prior year employment was above 4% for every year but 1982 (2.7%). The largest figure was in 1983 (7.4%), when the industrial sector started its recovery.
- o Despite the recession, at least one-third of the plants each year gained employment or remained stable, again except for 1982, when only 27% of the plants did so.
- o The number of jobs gained from plant expansions dropped each year as the recession wore on. The 1982 gross job gains were less than half of that for 1979. However, as the recession lost steam, the gross job gains jumped 1.5 times between 1982 and 1983.
- o Between one-fifth and two-fifths of the jobs gained were "recovered jobs," i.e. offset jobs lost through contractions in the same plants the prior year. This is another indication of the significant amount of "churning" in employment that went on in many plants.

As might be expected, gross job losses and gross job gains moved in opposite directions from year to year. So as the recession deepened, the extent to which expansions could cover gross job loss was substantially reduced. An comparison of gross losses to gross gains also indicates the existence of additional patterns. For instance, in every year, the ratio of plants with job loss to plants with job gain was less than the ratio of lost jobs to gained jobs. In fact, in the first and last years of the period, the number of expanding plants was greater than the number of declining plants. In other words, on average each losing plant lost more jobs than each expanding plant gained. This pattern exists even if closed plants are removed and only contracting plants are

compared to expanding plants. The ratios come the closest to each other in 1983, as the industrial sector's decline slows down and the number of new jobs jumps. It is unclear the extent to which this pattern represents the nature of firm behavior in response to the business cycle and the extent to which there exists some underlying trend of labor-saving technological change which adds to job losses and reduces job gains.

In terms of relative movement from year-to-year, gross job gains were almost as sensitive to the length of the recession as are job losses due to plant closings. For instance, the difference between 1982 and 1979 plant closing losses is 182%; that for 1979 and 1982 job gains is 132%. The difference between 1982 and 1979 contraction job losses is 36%. Despite these differences in relative sensitivity, the absolute difference between the high and low job figures in each category were much closer to one another. The 1982 plant closing job loss figure is 2,076 above that for 1979; the 1982 contraction job loss figure is 2,228 over 1979's. Nominal difference in gross job loss was 4,304, compared to 3,311 for gross job gains (which does not include entries, while losses include exits).

Finally, and very importantly, it may be that gross flows are a leading indicator of manufacturing employment change. When the employment decline bottomed out in 1983, job losses fell and job gains jumped dramatically. While the actual net change in employment in 1983 (-400) did not differ greatly from that in 1981 (-1,100), the change in the annual gross loss and gain and gain figures between 1982 and 1983 is dramatic, while the shift between 1980 and 1981 is not.

Job loss by type of plant closure. In light of the apparent sensitivity of job loss due to closures, I thought it would be interesting to explore patterns of annual job loss by type of plant closure, i.e. job loss due to a liquidation of plant operations (firm closure, liquidation of capacity in an open firm) and due to relocation to existing or newly-built facilities. These data are presented in Table 3.4. A number of patterns can be observed. First, as might be expected, the number of establishments in each

TABLE 3.4

JOB LOSS RESULTING FROM PLANT CLOSURES
BY TYPE OF CLOSURE, 1978-82
Plants with 50+ employees in 1978

Type of Closure	1979		1980		1981		1982	
	Emp.	Estab.	Emp.	Estab.	Emp.	Estab.	Emp.	Estab.
Operations liquidated:								
Firm closure	379	7	932	13	988	18	1262	18
Firm open	139	3	308	5	358	6	992	10
Subtotal	518	10	1240	18	1346	24	2254	28
Relocation of operations:								
Relocate to existing plant	510	5	185	4	301	6	586	9
Relocate to new plant	112	2	196	3	411	4	304	5
Subtotal	622	7	381	7	712	10	890	14
TOTAL	1140	17	1621	25	2058	34	3216*	42*

Job Loss as Percentage of Prior Year Employment

Operations liquidated:				
Firm closure	0.4%	0.9%	1.0%	1.4%
Firm open	0.1	0.3	0.4	1.1
	0.5	1.2	1.4	2.4
Relocation of Operations:				
Relocate to existing plant	0.5	0.2	0.3	0.6
Relocate to new plant	0.1	0.2	0.4	0.3
	0.6	0.4	0.7	1.0
TOTAL	1.1	1.6	2.1	3.5*

Source: DES/survey data base

* One 1982 closure involving 178 jobs included only in total because type of closure unknown.

Note: Job loss due to jewelry firm closures as a percentage of all job loss due to firm closures--

1979	30.8%	1980	82.3% (500-worker firm closed)
1981	19.4%	1982	56.0% (474-worker firm closed)

category tended to rise over the recession. Second, the level of job losses resulting from liquidations grew much more quickly than did losses due to relocations. As a percentage of the prior year's employment, job loss due to liquidations was almost five times higher in 1982 than in 1979. This pattern seems logical--one would guess that liquidations are in large part a function of aggregate demand, while relocations and consolidations of existing operations would seem to be more so a function of relative costs of operating elsewhere. While some respondents mentioned that their consolidations were induced by declining demand, overall it seems that relocations and consolidations may be somewhat less sensitive to the business cycle than are liquidations.

Third, within the liquidations category, losses due to firm closures rose much more quickly than did losses in open firms. The latter did not rise significantly until 1982. The firm closures were almost all single-plant and small multi-plant firms, which probably had less resources to ride out the recession than did larger multi-plant firms. Fifty-eight percent of firm closure job losses were in jewelry, the hardest hit industry. Although it does not show here, most of the liquidated operations of open firms came about through the decision to terminate a particular product line. It seems most of these firms, some large and some small, decided to cut less profitable lines only when the situation had significantly worsened. These relationships between plant characteristics and closings and many others will be explored in more detail in the next chapter.

Successive Cohorts. Table 3.5 presents annual gross flow data for plants over 50 in year t-1. The patterns that were evident in the first table basically are repeated here, with slight differences due to the dropping of declining plants once they go below 50 and the addition of small plants when they reach that mark. In general, the gross job losses are less and the gross gains larger. The largest difference is in the 1982 job gains--the 1981 cohort has greater job gains because a new 800-person shipyard reached full strength.

TABLE 3.5

ANNUAL GROSS JOB GAIN AND LOSS, 1978-83
Plants with 50 or more employees in base year

	78-79	79-80	80-81	81-82	82-83
Base Year Employment	103,970	102,900	98,063	94,367	85,213
First Year Establish.	511	499	486	474	439
Net % Change--All Mfg.	(1.3%)	(3.3%)	(0.4%)	(8.7%)	(0.2%)

Gross Job Loss	(7,307)	(9,594)	(8,681)	(11,448)	(6,753)
Contractions	(6,167)	(8,160)	(6,789)	(8,659)	n.a.**
Closures*	(1,140)	(1,434)	(1,892)	(2,789)	n.a.**
% gross loss	15.6%	14.9%	21.8%	24.4%	n.a.**
% of First-Year Emp.	7.0%	9.3%	8.9%	12.1%	7.9%
contractions	5.9	7.9	6.9	9.2	n.a.
closures	1.1	1.4	1.9	3.0	n.a.
Contraction Job Loss					
Recovered in Next Year	964	1,817	801	2,238	
% contraction job loss	15.6%	22.3%	11.8%	25.8%	
% gross job loss	13.2	18.9	9.2	19.5	
% of contracting est.	30.4	43.5	26.6	48.3	
which expand next yr.					
Gross Job Gain	5,819	4,688	4,538	3,118	6,596
% of First-Year Emp.	5.6%	4.6%	4.6%	3.3%	7.7%
Recovered Jobs as % of Gain	--	20.6	40.0	25.7	35.9

Ratios					
Losing/Expanding Plants	.94	1.64	1.12	2.12	.87
Lost/Gained Jobs	1.26	2.05	1.91	3.67	1.02
Contracting/Exp. Plants	.87	1.56	1.02	1.96	n.a.
Lost Jobs in Contracting	1.06	1.74	1.50	2.78	n.a.
Plants/Gained Jobs					

* Plants considered closed are those which essentially stopped manufacturing operations in either year of the two-year period or the subsequent year. For instance, the 1979-80 plant closing job loss figures include plants that closed in 1978, 1979 or 1980. Since I did not have an accurate list of 1984 closures, figures on closures and contractions for 1982-83 were not available.

** Minimum plant closing job loss figure for 1982-83 is 1,560; maximum contraction job loss figure is 5,193. Plant closure job loss is at least 25.4% of gross job loss.

Comparison of Findings to Other Gross Job Flow Studies

--Establishment-Based Studies

Very few research studies have attempted to measure gross job flows through either analyzing establishment data or through surveys of workers. Perhaps the most well-known establishment-based study is David Birch's "The Job Generation Process," in which he used the Dun's Market Identifier (DMI) file prepared by Dun and Bradstreet, the credit rating firm, to look at gross job flows for the U.S. and each of the 50 states for the 1969-76 period.¹¹ In another establishment-based study, Louis Jacobson of the Upjohn Institute for Employment Research used ES-202 data to prepare gross job flow figures for Pennsylvania for the years 1976-85.¹²

The Birch and Jacobson studies differ from this one in four ways. First, and foremost, both Birch and Jacobson assumed that, for the purposes of analysis, all account terminations and commencements indicated plant deaths and births, respectively. While they recognized that some accounts are stopped or started as the result of a change in ownership or corporate reorganization, they thought that the number of spurious births and deaths were not large enough to jeopardize the validity of the overall analysis.¹³ In the Rhode Island study, I attempted to remove all spurious deaths and births. A second difference between the studies is that the quality of ES-202 data is far higher than that of the DMI file. Third, the studies differ in terms of time frame and/or geographic area and/or economic sector. Finally, the Birch and Jacobson studies look at all firms and plants, and includes births, while the Rhode Island study is limited to plants of 50 or more and is a cohort study which excludes births.

With these differences in the studies in mind, I compared the annual average rates of job loss due to closures, contractions and expansions in the three studies to determine and attempt to explain any differences in rates. The findings of the three studies are presented in Table 3.6. To help control for differences in economic condi-

TABLE 3.6

ANNUAL AVERAGE PERCENTAGE CHANGE IN EMPLOYMENT BY PLANT STATUS
SELECTED STUDIES

	Deaths	Contractions	Expansions	Births	Net Change	
Birch--US						
1969-72	-5.2%	-2.9%	4.7%	5.7%	2.2%	
1972-74	-4.6	-2.6	5.3	5.6	3.7	
1974-76	-5.8	-3.4	4.4	6.8	2.0	
Birch--RI Mfg.						
1969-72	-5.2	-4.0	2.8	3.8	-2.6	
1972-74	-4.0	-2.2	5.3	3.2	2.1	
1974-76	-5.2	-4.0	5.2	2.2	-1.9	
Jacobson--PA						
1976	-5.9	-6.2	7.0	7.4	2.3	
1977	-6.0	-6.1	7.2	6.1	1.2	
1978	-4.7	-5.4	7.7	6.3	3.9	
1979	-5.0	-5.8	7.4	5.6	2.2	
1980	-5.1	-7.9	6.1	4.8	-2.1	
1981	-4.8	-7.4	6.2	5.4	-0.6	
1982	-5.9	-9.9	5.8	5.8	-4.2	
1983	-6.2	-8.4	6.8	5.0	-0.8	
Jacobson--PA Mfg.						
1975-85 Durables	-4.6	-7.6	5.0	4.7	-2.7	
1975-85 Nondur.	-5.3	-6.0	5.1	4.8	-1.4	
Reamer--RI Mfg. (Plants of 50+)						
1978-79	-1.1*	-5.9	5.6	n.a.	-1.3**	
1979-80	-1.4*	-7.9	4.6	n.a.	-3.3**	
1980-81	-1.9*	-6.9	4.6	n.a.	-0.4**	
1981-82	-3.0*	-9.2	3.3	n.a.	-8.7**	
1982-83	(-7.9***)	7.7	n.a.	-0.2**

* Closures include jobs lost in plants which closed in the subsequent year, e.g., the 1978-79 figure includes job losses for plants which closed in 1978, 1979 and 1980.

** Percentage net change for all manufacturing employment

*** Cannot disaggregate between closures and contractions because do not have complete information on 1984 closures. Minimum closure percent is 1.8%, maximum contraction percent is 6.1%.

tions, the annual net percentage change in each period is presented on the right of the table.

Several observations can be made. First, as might be expected, the rates of job loss and gain in each study seem to vary with the direction and extent of net change. Second, the plant closing job loss rate is much lower in the Rhode Island study than the rates in the other two, which in turn are quite similar to one another. It is striking that in the worst year of net decline in Rhode Island manufacturing employment (1982), with a percentage decline in net employment more than double that of any period of the other studies, the annual rate of job loss due to closures (3%) was below any rate of closure job loss in the Birch or Jacobson studies, even for years of economic boom. Moreover, when just manufacturing sectors are compared in periods of minor or moderate decline, the Birch and Jacobson figures are up to five times the Rhode Island ones. Finally, regarding contractions and expansions, the Rhode Island and Pennsylvania appear similar to one another and, with one exception, 2-3 percentage points above Birch findings for periods of similar net change. I explore these differences and their possible explanation in more detail below.

Differences in Job Loss Due to Closures. The much larger rates of job loss due to plant closures in the Birch and Jacobson studies can be attributed to significant numbers of spurious closures, plants for which a change in ownership or legal structure brought about a new D&B or UI account. It seems that in the Birch and Jacobson studies, spurious closures outnumber actual ones by a ratio in the neighborhood of 2:1 or 3:1, perhaps even 4:1 in years of economic growth. Evidence supporting this position comes from two studies that attempted to assess the validity of using the DMI file to count plant closures.

In 1986, the General Accounting Office of the U.S. Congress carried out a study of the causes and consequences of plant closings. In order to generate a list of closed plants, the GAO obtained from the U.S. Small Business Administration a printout of

plants that according to the DMI file had closed (i.e. the account had been terminated) or had a major layoff (over 20% of workers) during 1983 and 1984. To determine the accuracy of the printout, the GAO selected a stratified random sample of 2,400 plants with 100 or more workers and 200 plants with 50-99 workers. Through a telephone survey, GAO staff reached 90% of the sample plants. Only 600 had actually experienced a closure or permanent layoff in the 1983-84 period.¹⁴

In June 1984, a comparison of DMI "closures" and ES-202 closures was prepared by myself and a colleague from data and information collected by the Massachusetts Governor's Commission on Mature Industries.¹⁵ The Commission was appointed by Governor Dukakis the previous year to study the problems faced by owners and employees in the state's traditional manufacturing industries. Originally, the Commission planned to identify recent plant closures through a DMI list prepared by the SBA. However, again through a telephone survey, the list was determined to be so filled with open plants that the Commission turned to the state Division of Employment Security for an accurate listing of closures. The DMI and DES lists did not completely overlap--the former was for 1981-82 and the latter 1982-83. A comparison of the DMI and the DES lists, supplemented from information gathered through phone calling, indicated that at least 50% of the DMI deaths were spurious. This was thought to be a conservative estimate because attempts were not made to reach all firms on the DMI termination list.

The extent to which spurious closures outnumber actual ones also is supported by the findings in Chapter 6 that the ratio of LED spurious closures to actual ones is 1.5:1. The Census Bureau has attempted to keep a permanent plant number (the LED equivalent to an account) even when ownership changes. Consequently, the ratio for the DMI and ES-202 files, in which no attempt is made to eliminate spurious closures, must be higher.

The presence of substantial spurious closures in the Birch and Jacobson studies is further indicated by the fact that, in several ways, my definition of plant closure

job loss is more liberal than those in the Birch and Jacobson studies. First of all, I include "virtual closures," establishments in which employment has been reduced by over 90%, but there remain a few workers on site. These virtual closures retained a UI account. However, virtual closures were not counted as plant deaths in either the Birch or the Jacobson studies as long as the establishment retained an account. Second, I place in the plant deaths category all jobs losses in the year of and the year prior to closing. Jacobson only counts loss in the year of closing. (Birch counts job loss from the last known measurement, which can be anywhere from a few months to several years prior to closure.) Third, while my unit of analysis is the plant, Jacobson's is the UI account. Thus, Jacobson places job loss from a closed plant in a multi-plant UI account in the contractions, not the closures, category. In sum, I think that if the method of counting job loss due to plant closures were made equivalent in each of the studies, the gap between my finding and those of Birch and Jacobson would be even larger.

The extent of the differences among the studies and the presence of spurious closures cannot be accurately determined because the Rhode Island study does not include plants of less than 50 employees. However, Rhode Island establishments of less than 50 employees provided only approximately 22% of state manufacturing employment over the 1978-83 period.¹⁶ Now many small establishments are likely to represent new firms, and new firms are the ones most likely to fail. Firms between 0 and 5 years of age account for nearly half of all manufacturing firm failures in the U.S.¹⁷ However, a sensitivity analysis indicates that a substantially higher rate of closings among small plants could not adequately explain the gap in rates between the linked and unlinked studies. For instance, if the rate of job loss due to closure for small plants was three times that of larger plants, the overall rate of job loss would rise only another 44%, e.g., from 1.4% to 2.0% in 1980.

One statement often quoted from the Birch study is that the rate of job loss due to plant closures tends to be the same for all states, no matter what their economic con-

dition. In light of the extent of spurious closures, this finding needs to be re-examined. The relative difference between a state with a 1% rate of loss and one with a 2% rate looks much larger than that between a state with a 5% rate and one with 6%.

This Rhode Island study could not look at job gains due to plant births. However, it should be pointed that out spurious births go hand-in-hand with spurious deaths. Thus, the rates of job gains due to births in the Birch and Jacobson studies probably are overstated to the same extent as are deaths. As I understand Birch's study, spurious births were given an initial age of 0 and initial size of 0. Consequently, Birch's oft-quoted findings that small firms created 66% of new jobs and young firms 80% is probably an exaggeration of reality.

Differences in Job Loss Due to Contractions and Job Gains Due to Expansions.

Birch's estimates for contractions and expansions tend to be lower than those for this study for two reasons. First, the DMI data were collected in a rather haphazard, imprecise and untimely manner. A comparison of Massachusetts plant employment figures provided by DMI with ES-202 data provided by the state's Division of Employment Security indicates many instances of wide variation between the two figures. Jacobson points out the irregularity with which D&B data are collected.¹⁸ Moreover, firms with DMI files have the incentive to underreport contractions so as not to look bad to potential creditors. On the other hand, by law a firm's reports to the state employment security agency must be accurate and UI files are not used by potential creditors.¹⁹

The second reason for Birch's low contraction and expansion figures is a secondary effect of the problem of spurious closures and births. If an establishment changed ownership and contracted in the same period, that contraction will be missed. Instead, the job loss will show up in a spurious birth smaller than the spurious death. The reverse is true for an establishment which changed ownership and grew in size--

the expansion will show up as a spurious birth and a smaller spurious death. This second problem also must be true of the Jacobson study.²⁰

--Survey-Based Studies

While a number of case studies of displaced workers has been carried out over the years, there was not a large-scale survey specifically designed to identify workers who lose jobs or are otherwise displaced until several years ago, when the U.S. Bureau of the Census carried out such a survey for the U.S. Bureau of Labor Statistics.²¹ This survey was a special supplement to the March 1984 Current Population Survey of 60,000 households. The survey reached approximately 2830 displaced manufacturing workers, 1650 (58%) of whom had 3 or more years job tenure.²² Of this latter group, 49% reported that they were no longer at their job because of a plant closure. This figure is significantly higher than the 37% figure reported in the this study for the 1978-83 period. There are several possible factors that could explain this difference.

First, the BLS figure might be higher because it only reports on workers with 3 or more years on the job. As manufacturing employment peaked in 1979 in the U.S., there are large numbers of workers with less tenure who were likely the first to go when contractions started. If 25% of the workers with less than 3 years tenure were laid off as a result of plant closings, then the rate for the whole group falls to 39%.

A second possible reason for the difference between the BLS finding and that in this study is BLS sampling error. Third, whatever family member answered the BLS survey (which may not be the displaced worker) may not have known that a contraction, rather than a closure, took place. Finally, there may be structural differences between the Rhode Island economy and the U.S. economy that produce a lower rate of job loss due to plant closures in Rhode Island. However, it should be pointed out that even if the U.S. percentage for all manufacturing workers is a third higher than that for Rhode Island, that would do little to explaining the variation between the Birch

and Jacobson studies and this study on the extent of job loss due to plant closures. The difference would still be due primarily to spurious closures.

Implications of Findings

The analysis of gross job flows in Rhode Island suggests that there exists substantial and complex patterns of employment change at the plant level that cannot be seen simply by looking at shifts in aggregate figures. Moreover, it is clear that an accurate picture of these patterns can be obtained only if the data base is truly longitudinal. Patterns of gross manufacturing job flows in Rhode Island suggest a number of generalizations that could be tested through analyses of linked ES-202 data in other states and for periods of expansion and decline:

- o Significant gross job losses and gains occur in both the best and the worst of economic conditions.
- o The majority of annual gross job losses are due to plant contractions.
- o While a significant number of jobs are lost due to plant closings, the number is not nearly as high as estimated in previous studies. However, it is probable that a higher proportion of jobs lost in plant closings result in economic displacement than is so for jobs lost in contractions, because the latter includes retirements, voluntary quits, and temporary layoffs.
- o Job loss through plant closures is relatively more sensitive to the length of a recession than is job loss through contractions. Specifically, the percentage of lost jobs due to closures, and the actual number of closure-caused job loss, increases significantly with the depth and length of the recession.
- o Increases in job losses due to plant closings as a recession deepens are primarily due to increases in job losses due to the liquidation of plant operations (particularly firm closures). Job losses due to relocations seem less sensitive to the business cycle.

- o A large number of jobs lost in contracting plants are regained the next year. The percentage changes in direct relation to economic conditions. Thus, a significant amount of job "churning" goes on at the plant level.
- o As manufacturing employment decline bottoms out, there is a dramatic drop in gross job losses (from both contractions and closures) and a dramatic increase in the gross job gains. Such shifts in gross flows might serve as leading indicators of economic recovery.
- o In times of recession, contracting plants lose more jobs on average than do growing plants. In times of growth, the reverse may be true. To the extent that the reverse is not true, the introduction of labor-saving technology may be the reason.

CHAPTER NOTES

¹The gross flows analysis moves the point at which net measurements of employment change are made from the level of the economy or industrial sector to the level of the plant. Consequently, I cannot capture gross flows within a plant. For example, if a plant eliminates 10 production line jobs and then adds 5 equipment maintenance jobs and 5 jobs in the front office, in this gross flows analysis employment in the plant looks stable.

²In the face of the large layoffs and high unemployment rates in Rhode Island during the 1982 recession, Governor Garrahy appointed a Strategic Development Commission to undertake an in-depth study of the state's economy and prepare a set of public policy recommendations aimed at economic revitalization. Part of that study was a detailed examination of the problem of manufacturing plant closings, of which I had charge. For the purposes of identifying closed plants and the size of the employment loss, I was granted temporary access to the unemployment insurance records of the state Department of Employment Security. To gain such access, I was required to sign a statement that I would keep strictly confidential all firm-specific information, consistent with the state's laws protecting the confidentiality of information filed by participants of the UI system.

The work of the Commission ended in 1984 with the defeat of a public referendum on the Commission's proposals. For the purposes of completing this doctoral dissertation, I sought, and was granted, permission to use data that had been available under Commission auspices, with the explicit understanding that I would continue to strictly respect the confidentiality agreement.

Originally, I was granted access to two types of data and information. The first was account employment data from the DES data banks. Second was information of firm and plant characteristics that were contained in the account paper files such as year of firm founding and acquisition information. Soon after I had completed collection of the employment data, a new executive director of DES was appointed by the state's new governor. The new director decided not to honor the arrangement allowing my access to UI data. Consequently, I decided to collect firm and plant organizational characteristics through a telephone survey. The results of the survey formed the basis for the analysis in Chapters 4 and 5.

³The results of this survey are intended to update each plant's SIC code. In theory, the adjustment of the employment proration formula is to take place every three years, but a perusal of the data base indicates adjustment was made less frequently for a number of plants.

⁴In cases in which an employment figure did not appear in the printout because employment was under 50 and was missing from the microfiche, the interpolation rule was that the midpoint value would be inserted unless that value was 50 or more, in which case a value of 49 would be used.

Rules for filling in missing values in 1977 or 1983 were somewhat more complicated. Straight extrapolation was used if that did not produce a steep curve in one direction of the other. The next best alternative was employment estimates in newspaper articles or the RI Manufacturers Directory. The last alternative was an ex-

trapolation which flattened the curve.

A random sample of data entries for 157 plants to see how many had missing values yielded the following results:

- 109 (69) had values for all months in which the plant operated
- 36 (23%) had 1 or 2 missing values
- 9 (6%) had more than 2 missing values, but the interpolation/extrapolation seemed reasonable
- 3 (2%) had no valid figures for a long period of time--news article/directory estimates used

⁵This is a good place to point out that even if I were allowed to use the DES tapes, the need to check all the new and terminated accounts for links probably would have caused me to set a lower limit on establishment size anyway. I estimate that the full population of manufacturing plants from 1977 to 1983 is represented by somewhere between 5000 and 6000 accounts. Checking for linkages in a data set of this size was well beyond my available resources. I might have analyzed a sample of small plants, e.g., in the textile industry or in a medium-sized town.

⁶There were a monthly average of 3,351 units reporting to DES in 1978. (Rhode Island Department of Employment Security, "1979 Statistical and Fiscal Digest.")

⁷Note that the residual group is not a cohort, unlike the other three groups. It includes births.

⁸The data on plant characteristics comes from survey data base.

⁹Of course, there is no information as to (1) whether the lost jobs were actually recovered or whether jobs of different scope and pay were developed instead, and (2) if lost jobs were reinstituted, whether or not the laidoff workers were rehired.

¹⁰I did not count a plant as closed if more than 20% of the laidoff workers transferred to a nearby sister plant. There were only five closed plants among 76 in which any workers were transferred to a nearby sister plant, and in 2 of those, some workers in the receiving plant lost their jobs in the process.

¹¹David Birch, "The Job Generation Process," (Cambridge, MA: MIT Program on Neighborhood and Regional Change, 1979).

¹²Louis Jacobson, "Job Creation and Destruction in Pennsylvania, 1975-85," (Kalamazoo, MI: The Upjohn Institute for Employment Research, November 1986).

¹³Birch asserted that spurious births and deaths were not a significant problem: "Fortunately, the magnitude of such spurious changes is not great, averaging less than one percent (emphasis added) of births and deaths in any year."(op.cit., p. 13.) He did not describe the method he used to arrive at this figure.

Jacobson did not provide a specific estimate for spurious births and deaths, but he seemed to believe they were not a serious issue:

In this analysis a birth occurs when a unit begins reporting under a given identification (ID) number and a death occurs when reporting is terminated or falls permanently to zero. These definitions are deceptively simple. Occasionally (emphasis added) a firm which 'dies' (stops reporting) will not

actually cease operating but merge with another firm to form a new successor firm, by acquired by another firm or simply change ID number because of reorganization or movement of the headquarters to another county. (op.cit., p. 3.)

¹⁴U.S. General Accounting Office, "Dislocated Workers: Extent of Business Closures, Layoffs, and the Public and Private Response," July 1986. In a telephone conversation, one of the study authors told me that another 191 plants had a closure or layoff that occurred outside of the 1983-4 time frame.

¹⁵Andrew Reamer and Beth Siegel, Memorandum to David Hirschberg, Office Of Advocacy, U.S. Small Business Administration, June 11, 1984.

¹⁶I noted earlier that my data base covers 77% of employment in 1978, which should leave 23% for the small establishment group. However, as I looked for three successive observations of 50 employees, I understate slightly the number of people who worked in plants of 50+ at a given moment. County Business Patterns says that in 1978, establishments of less than 50 employees provided 21% of manufacturing employment.

¹⁷U.S. Small Business Administration, The State of Small Business: A Report of the President (Washington, DC: Government Printing Office, March 1983), p.238.

¹⁸Jacobson, op.cit., p. 2.

¹⁹A small businessman acquaintance told me that he regularly understated any contractions to Dun and Bradstreet. Birch also mentions a corporate president who said he never reported accurate employment figures to Dun and Bradstreet. Birch notes that there is no practical way to measure the degree of misrepresentation. He does say that if D&B discovers the misrepresentation, the firm's credit rating could be altered. (Birch, op.cit., p. 17-18.) However, it seems to me that misrepresentation would be difficult to prove unless there was a large and obvious variance between actual and reported figures.

²⁰Information regarding the Pennsylvania economy lends support to the idea that the rates of job change due to contraction could logically be higher. For instance, net manufacturing employment in Pennsylvania fell 21% between 1979 and 1983. Rhode Island net manufacturing employment fell 14% over five years.

²¹U.S. Bureau of Labor Statistics, Displaced Workers, 1979-1983, Bulletin 2240, July 1985.

²²These figures were drawn from Podgursky and Swaim, op.cit.

CHAPTER 4

THE RELATIONSHIP BETWEEN PLANT CLOSINGS AND ORGANIZATIONAL CHARACTERISTICS

The gross flows analysis provided a picture of the components of manufacturing employment change in Rhode Island. However, it could do little to explain why the changes, particularly gross job losses, occurred as they did. In Chapter 1, I set out a framework of suggested causes for manufacturing job loss. The purpose of this chapter and the next is to examine the relationship between employment change and organizational characteristics, and to utilize the findings to help explain the role of institutional, structural and macroeconomic factors in job loss. This chapter explores the relationship between plant closings and organizational characteristics, using logit regression models and a descriptive analysis of the closed plants. The next chapter utilizes ordinary least squares regressions to examine the extent to which organizational characteristics can explain percentage employment change in all plants.

Hypotheses Regarding the Relationship between Plant Closures and Organizational Characteristics

Several researchers have explored the causes of plant closures through an examination of a population of closed plants.¹ A few others have looked at patterns of closure in a particular industries.² A handful of studies have been published which analyze the effect of the presence or absence of one characteristic, e.g. absentee ownership, on the likelihood that a plant will close.³ However, no study to date has attempted to look at a large geographically-bounded population of plants across a number of plant characteristics to determine the comparative influences of these characteristics on the probability of closure.⁴

Utilizing Chapter 1's framework of suggested causes of plant closures, I developed a number of hypotheses concerning the effects of particular organizational characteristics on the probability of a plant's closing.⁵ I chose these organizational characteristics for their ability to represent particular suggested causes of closings and for the feasibility of collecting information on them through a survey. The organizational variables, the hypotheses relating each variable to the probability of closure, and the rationale behind each hypothesis are described below:

- o Plants belonging to multiple-plant companies are more likely to close than are single-plant firms. First, a plant in a single-plant firm is a much more "lumpy" commodity than is one in a multi-plant firm. For instance, in a two-plant company, a 50% cutback in operations could result in a plant closure, whereas in a single-plant firm, a 50% cutback would not reduce the number of plants. Second, a multi-plant firm is likely to have a more diversified product line than is a single-plant firm. As a consequence, a multi-plant firm is more likely to make a decision to pull its assets out of one product line (and plant) and invest them in another, more profitable line, at a different location.
- o Plants belonging to firms headquartered outside of Rhode Island are more likely to close than are firms headquartered inside the state. Owners of firms headquartered locally would be less likely to relocate operations out of the area because primary manufacturing facilities tend to be near headquarters and because, studies have suggested, owners of smaller, privately-held firms are reluctant to uproot themselves and their families from long-term community attachments. On the other hand, firms headquartered outside the state would be more likely to close a Rhode Island plant. Outside companies are likely to have plants in a number of sites. Decisions to relocate operations to a new or existing plant would be made for purely economic reasons.

- o Plants that are acquired by new owners are more likely to close than are plants in firms operated by the founder or his family. Acquirers would have less familiarity with how to profitably operate the plant.
- o Moreover, if an acquired plant closes, it is more likely to do so sooner rather than later after the acquisition. Acquirers would tend to find out very quickly that they cannot operate the plant at the required level of profit. Also, acquirers which are multi-plant firms may close a plant quickly because they decide it is better consolidated with operations elsewhere.
- o Plants belonging to newly founded companies are more likely to close than are plants in more established firms. Younger firms would have troubles due to inexperienced management. Firms between 0 and 5 years of age account for nearly half of all manufacturing firm failures.⁶
- o Plants belonging to publicly-traded firms are more likely to close than are plants belonging to privately-held firms because the publicly-held firms, in catering to pressures for short-run profits, would be less likely to hold on to plants in the long-run.
- o Plants of a smaller size will be more likely to close than larger plants. First of all, small single-plant firms would have a higher probability of failure than larger firms because the former do not have the same depth of resources, financial and managerial, to avoid and withstand periods of adversity as do the latter. While companies with under 100 employees accounted for 93.7% of all companies, they provided 99.2% of all bankruptcies in 1981.⁷ Second, in the face of declining demand, small plants in multi-plant firms would be more likely to be closed than would larger plants in the same firms because of small plants' lower economies of scale and/or an approach to cut-backs in which smaller amounts of capacity are liquidated first so that the company can retain the capacity to quickly respond to an upturn.

- o Plants whose primary product is not the primary product of the firm as whole are more likely to be closed than are those plants whose primary product is considered by the firm to be its primary product. This hypothesis concerns plants in multi-plant companies--plant and firm primary product in single-plant companies are the same by definition. The rationale for the hypothesis is that if a product is not considered by the firm to be in the mainstream of its economic activity, the firm would be more likely to close the plant due to a lack of competence in a less familiar product line or a desire to redeploy assets into a more profitable one.
- o The probability of a plant's closure varies inversely with the percentage change in U.S. industry employment in the 4-digit SIC code of the plant's primary product. I used percentage change in national employment as a catch-all variable that captures macroeconomic and structural factors that impact on the industry generally, e.g., shifts in aggregate demand, currency exchange rates, changes in taste, technological change, and new foreign entrants in the industry.
- o Plants with a unionized workforce are more likely to close than are non-unionized plants; moreover, the percentage of the workforce covered by collective bargaining agreements directly influences the frequency of closure. A plant with a high level of unionization would be more likely to close than a non-unionized plant because of high wage costs and union constraints on management's ability to allocate technical resources and labor. Management of unionized plants in larger firms would tend to respond to these costs and constraints by either relocating or liquidating operations. Unionized plants in small firms would tend to have a higher rate of closure because they could not compete with non-unionized operations.

Methodology for Preparing the Data Base

--Population and Analytic Structure

I tested the above hypotheses through a series of logit regression analyses in which "plant closed" is the categorical dependent variable. Table 4.1 sets out the dependent and independent variables, the categories used for categorical variables, and the source of information on each variable.

For the logit analysis, I used the entire data base population, i.e. all Rhode Island manufacturing plants that had 50 or more employees for at least three successive observations (e.g., June-December-June) between June 1977 and December 1983. This population numbered 582 plants.⁸ The criterion of three successive observations of 50 or more employees meant that the earliest closures in the data base were those that took place in the second half of 1978.

If complete data had been available for plants of less than 50 employees, it is likely that I would have built a second model, for smaller plants. The addition of smaller plants into a single model would have increased the number of plants in the data base nearly 600%. As the very large majority of plants would have been single-plant, RI-based firms, clarity regarding the dynamics of large multi-plant and non-RI employers would have been lost. Also, the introduction of a large number of small and new firms would have given firm age a very large role in plant closures. A study by the Rhode Island Strategic Development Commission indicated that 80% of the manufacturing firms incorporated in 1975 and 1976 no longer had DES accounts by 1983.⁹ Even with a generous allowance for spurious closures, it seems that a very large number of new manufacturing firms did not last very long.

I am more interested in accounting for job loss through plant closings than determining the incidence of plant closings per se. Using a sample that excludes smaller plants and firms, but has significant variation among plants in terms of size and firm age and provides coverage of 78% of manufacturing employment, allows for the

Table 4.1

ORGANIZATIONAL VARIABLES AND SOURCES OF DATA

<u>Variable</u>	<u>Data Sources</u>
Multi-plant firm (Y,N)	Survey, DES, <u>RI Directory of Mfg.</u>
Non-RI firm headquarters (Y,N)	Survey, DES, mfg. directory, corporate registration
Age of firm 1/1/84 or year of closing	Year founded--survey, news articles, corporate registration
Acquisition of firm or plant (Y,N)	Survey, DES, news articles, corp. reg.
If acquired, years since most recent acquisition	Year acquired--survey, DES, news articles, corporate registration
Firm publicly-traded (Y,N)	Survey, library reference service
Plant size	DES (highest June-December average, 1977-83)
% Change in U.S. employment in 4-digit SIC code of plant's primary product, 1978-83	Plant primary product--survey, DES, mfg. directory SIC classification--DES, mfg. directory, <u>Standard Industrial Classification Manual</u> 4-digit employment change--U.S. Bureau of Labor Statistics
Union in plant (Y,N)	Survey, union officials
If unionized, % workers covered by collective bargaining	Survey, union officials
Plant/firm industry difference (Y,N)	Industry focus of firm--survey

Multi-plant owner	Multi-plant firms--as above Single-plant firms--survey, news articles
Non-RI owner	Multi-plant firms--as above Single-plant firms--survey, news articles

possibility of some clarity in seeing the dynamics of the major providers of jobs. This is not to say that job loss through small plant closures is unimportant or that it would not have been useful to build a second model for smaller plants. A two-model study could have provided a very full picture of the dynamics of job loss through plant closures.

I sought information on the characteristics of each plant and firm at one point in time--as of December 1982 for open plants and as of the time of closure for closed plants. I did not attempt to record the characteristics of prior owners nor to tally the number of times a firm or plant changed hands in its history. Having this information certainly would have made the data base richer. However, my budget could not support the extra effort required to obtain and analyze such information. Moreover, it was not clear that respondents could accurately explain or even would desire to explain a chronology of corporate ownership, with attendant owner characteristics and dates of ownership change.

I chose December 1982 as the point in time for which to seek characteristics for open plants because I thought that, overall, the firms in charge then were the ones most likely to be responsible for the status of the firm in December 1983. For the plants which changed hands in 1983, it did not seem appropriate to characterize the December 1983 status of the plant (and plant employment, for the OLS regressions) as a function of the characteristics of an owner of several months. For each plant closure, I gathered characteristics of the firm that made the decision to cease operations.

--Data Sources

The primary source of data for most characteristics was a telephone survey, which was carried out by three research assistants.¹⁰ An attempt was made to reach someone knowledgeable regarding every plant in the data base. Information was obtained by telephone for 71% of the plants, with another 4% responding through a mail

survey. (A mail survey was sent when requested by a respondent as an alternative to the phone interview.) Regarding the 25% of the plants which were non-respondents, 8% was attributable to mail survey non-respondents, 6% to firms that were unreachable, 6% to outright refusals, and 5% to firms that were reachable but for which the person designated to answer the survey repeatedly was not available and did not return phone calls.

For non-respondents, information on non-RI headquarters, plant product, and multi-plant firm was obtained from the DES printouts and from the Rhode Island Directory of Manufacturers. Information on non-respondents regarding the extent of union presence was provided by state and local union officials. Three data items were more difficult to obtain for non-respondents--age of firm, acquisition, and date of acquisition. Information on non-respondent closed plants and plants with major layoffs also was obtained from Providence Journal clipping files and corporate registration information filed with the Secretary of State.¹¹

--Determination of a Plant Closure

Although I labelled the dependent categorical variable "plant closed," more accurately the variable was not a function of site but of labor force. In other words, the relocation of manufacturing operations to a new site was not considered a closure if the majority of workers at the old site were employed at the new one.

The difference between a "closed" and an "open" plant was not always clear-cut. There were a few instances in which a massive layoff took place but there were a few people left working on the site. If manufacturing operations ceased entirely, I considered the plant closed. I also considered the plant closed if manufacturing operations were still ongoing but the workforce level had declined more than 90% from the peak level achieved earlier in the 1977-83 period. Only four plants fit this latter criterion.

--Determination of the "Firm"

One of the more complicated issues in the research process was defining "the firm" operating a plant. For the majority of plants, the identity of the firm was clear. However, in many multi-plant firms, the plant might be part of a subsidiary or a division. In these instances, I needed to consider which characteristics I wanted regarding the corporate parent and which regarding the subsidiary or division.

Given the rationales behind my hypotheses, I decided that for the non-RI headquarters, multi-plant firm, and publicly-traded variables I wanted the information for the ultimate corporate parent. I assumed that the hypothesized influence of these characteristics would emanate from corporate headquarters. On the other hand, I wanted information on two characteristics of subsidiaries and divisions--year of founding and acquisition. As subsidiaries and divisions tend to be functionally distinct from the parent in terms of product line, I thought that the age of the subsidiary or division (proxy for amount of experience in business) would be a more telling figure in relation to probability of closure than would the age of the parent. In cases in which the subsidiary or division was acquired, I attempted to obtain the founding date of the original firm.¹²

In a few instances, a firm was created by its management through a buyout of a subsidiary or division of a larger corporation. I considered the newly formed company an acquisition and, for the purposes of a founding date, attempted to trace continuous operations as far back in time as possible.

--Discussion of Selected Variables

Many of the variables listed in Table 4.1 are self-explanatory. For each one that is not, the concepts behind the variable and the decision rules created for coding are discussed below.

Size. Each plant's size was defined by its peak annual employment figure. There was no reason to pick a particular base year employment figure as having special influence on whether a plant stayed open or closed.¹³

Multi-firm owner. For single-plant firms, the respondent was asked if the owner had controlling interest in other businesses which together had 50 or more employees. I wanted to know if the firm was functionally a part of a multi-plant organization, in order to see how similar the probability of closure for such firms was to that for plants in multi-plant firms. As a result, I had alternative variables for describing the size of plant holdings, using alternative units of observation--firm and firm owner. The difference between the two variables was simply a function of where I placed multi-firm owners of single-plant firms (who owned approximately 12% of all plants).¹⁴

Non-RI owner. For RI-headquartered privately-held firms, the respondent was asked if the controlling owner lived in Rhode Island or within a half-hour commute of Rhode Island. The intent of this question was to see if the absence of the owner from a RI-headquartered company raised the probability of closure.

Plant/firm industry difference. For multi-plant companies, I needed a decision rule for determining whether or not a plant and its parent firm were in the same industry. I considered a plant and a firm to be in the same industry if the plant's primary product and the firm's primary products were the same or were vertically or horizontally linked. For instance, a baby food company acquired a RI plant which made accessories for babies' bedrooms. Because I thought that both the firm as a whole and the RI plant served the same market (parents of young children), and the sales operation of the accessories plant seemed to fit with the marketing expertise of the parent, I considered the firm and the plant to be in the same industry. Clearly, judgments regarding this characteristic were subjective.

Percentage U.S. employment change in industry, 1978-83. I intended this variable to measure the effect of a plant's product concentration. I originally used 1977-83

percentage change, but found that the 1978-83 figure gave a more robust result. This makes sense--1977-78 was a growth year for most industries, while the 1978-83 period was a period of straight employment decline for many. Because the 1978-83 percentage employment change gave sharper declines than did the 1977-83 figure, the former more accurately reflected shifts in aggregate demand faced by the plants.

Profile of Manufacturing Plants in the Data Base

--Plant Population by Organizational Characteristics

In terms of the organizational variables, Rhode Island's manufacturing plants of 50 or more employees were distributed as follows (Table 4.2):

- o Nearly three-quarters of the plants had company headquarters inside the state. However, roughly 1 in 15 RI-headquartered plants were controlled by an owner who lived outside the area.
- o Almost 60% of the plants were part of a single-plant company. However, around 1 in 5 of the single-plant companies were held by owners who also operated at least one other company with 50 or more employees.
- o Approximately 40% of the plants were acquired. Of the acquired plants, 72% had been acquired between 1970 and 1982, and 48% between 1977 and 1982.
- o Seventy percent of the plants had no union representation.
- o Plants operated by publicly-held companies accounted for only 17% of the total.
- o The average firm age was 47 years. The average peak plant employment in the 1977-83 period was 218. Employment in the national industry corresponding to each plant's primary product on average dropped nearly 15% between 1978 and 1983.

There were striking differences between the characteristics of plants in single-plant firms and ones in multi-plant firms:

Table 4.2

PROFILE OF PLANT CHARACTERISTICS
RHODE ISLAND PLANTS WITH 50+ EMPLOYEES DURING 1977-83 PERIOD

Characteristic		N*	All Plants		In Single-Plant Firms		In Multi-Plant Firms	
			%		%		%	
Multi-plant firm	N	579	58.2		-		-	
	Y		41.8		-		-	
Multi-plant owner	N	488	40.2		-		-	
	Y		59.8		-		-	
Non-RI HQ	N	580	73.3%		98.5%		38.0%	
	Y		26.7		1.5		62.0	
Non-RI owner	N	499	65.1		95.6		28.2	
	Y		34.9		4.4		71.8	
Acquisition	N	494	59.3		78.8		33.2	
	Y		40.7		21.2		66.8	
Union	N	575	70.1		80.7		55.2	
	Y		29.9		19.3		44.8	
20%+ Workers unionized	N	575	73.0		82.8		59.3	
	Y		27.0		17.2		40.7	
Plant & firm diff. indus.	N	501	86.6		100.0		70.4	
	Y		13.4		0.0		29.6	
Publicly-traded	N	562	82.6		100.0		51.2	
	Y		17.4		0.0		43.8	
			mean	median	mean	median	mean	median
Plant size			218	116	135	96	334	184
Firm age			47	38	43	37	53	44
% U.S. emp. change in plant's industry			(14.6%)	(14.7%)	(16.9%)	(15.7%)	(12.0%)	(12.6%)
% union			24.5%	0%	15.7%	0%	36.8%	0%

* Number of plants with no information for each characteristic = 582 - N.

Note: Percentages for plants with multi-plant owners and non-RI owners are likely overstated because of a bias in the set of non-respondent plants, which are primarily small RI-HQ companies. Minimum is 50.4% for the former, 30% for the latter.

- o While almost all single-plants firms were RI-headquartered, nearly two-thirds of the plants in multi-plant companies were not.
- o While 79% of the single-plant firms were being operated by their founder or his family, two-thirds of the plants in multi-plant companies had been acquired.
- o While only 19% of the plants in single-plant firms had some union representation, 45% of plants in multi-plant companies did.
- o As would be expected, no single-plant company was publicly-traded. On the other hand, 44% of the plants in multi-plant companies were in publicly-traded firms.
- o Plants in single-plant firms tended to be younger than and half the size of plants in larger companies. Also, plants in single-plant firms tended to be in industries with large employment declines in the 1978-83 period than were plants in multi-plant firms.

In terms of the distribution of plants by industry, jewelry and textiles dominated, particularly among single-plant firms, 36% of which were in the jewelry industry. (See Table 4.3.) The distribution of plants in multi-plant firms was much more diversified. A similar distribution by industry can be seen when plants are broken down by location of headquarters, because almost all single-plant firms were locally headquartered and nearly three-quarters of plants in large companies were headquartered out of state.

--Frequency of Closure by Organizational Characteristics

Between 1977 and 1983, 13.1% of Rhode Island's plants of 50 or more employees closed. The total job loss in these plants came to 12,565, as measured from peak annual employment. Figure 4.1 is a stem-leaf diagram of the distribution of closed plants by peak size. Note that the median peak size of closed plants was 111 employees.

Table 4.3

Rhode Island Plants with 50 or More Workers, 1977-83
by Major Industry Group

	All Plants	In Single-Plant Firms	In Multi-Plant Firms	RI HQ	Non-RI HQ
Food	22	11	11	15	7
Textiles	83	47	35	65	17
Apparel	18	12	6	10	8
Lumber, furniture, paper	22	12	10	14	8
Printing, publishing	18	12	6	16	2
Chemicals	11	4	7	5	6
Plastics	24	14	10	17	7
Leather	11	3	8	6	5
Stone, clay, glass	10	4	6	4	6
Primary metals	29	12	17	15	14
Fabricated metals	30	19	11	25	5
Machinery	26	8	17	14	11
Electronics	40	15	25	23	17
Trans. equip.	18	11	7	13	5
Instruments	29	9	20	11	18
Jewelry	151	120	30	138	13
Misc.	40	24	16	33	7
Total	582	337	242	424	156

Note: Firm characteristics could not be obtained for a small number of plants. Therefore, the addition of the figures in columns 2 and 3 and in columns 4 and 5 may not add to the figure in column 1.

Figure 4.1

STEM AND LEAF PLOT
PEAK SIZE OF CLOSED PLANTS, 1978-83

N = 76

MINIMUM IS: 56.000
LOWER HINGE IS: 82.000
MEDIAN IS: 110.500
UPPER HINGE IS: 204.000
MAXIMUM IS: 600.000

```

0 555
0 666666677777
0 H 8888888889999999
1 M 00000001
1 22233
1 44455
1 677
1 8899
2 H 001
2 3
2 4
2 7
2 8
3 1
3 22
3 5
3 7
3 8
***OUTSIDE VALUES***
4 01267
5 0
6 0

```

Notes: Peak size is the highest annual employment in the 1977-83 period.

Twenty-five percent of the plants are smaller than the lower hinge and 25% of the plants are larger than the upper hinge.

Table 4.4 provides the frequency of closure by plant characteristic. The strength of the multiple-plant firm variable is worth noting. Five categorical variables have a strong chi-squared when all plants are taken as a whole; among the continuous variables, percentage union had a strong t statistic. However, when frequency of closure is examined separately for single-plant firms and multi-plant firms, the strength of the results is greatly diminished for these variables. One effect of the higher frequency of closure for plants in multi-plant firms is that such plants accounted for 58% of the closures, while they comprised only 42% of the plant population as a whole. It is startling that nearly 20% of all plants in multi-plant firms closed in a six-year period.

Moreover, notice that the frequency of closures by multi-firm owners of single-plant firms (17.7%) is quite close to that of multi-plant firms (18.2%). On the other hand, the frequency for single-plant owners is less than half of these, 7.1%.

The jewelry industry provided over one-quarter of the plant closures, with the textile industry the second largest contributor at 16%. However, the frequency of closure in these industries was very close to the overall average.

Closure rates by industry are provided in the appendix. For the continuous independent variables, tables indicating the frequency of closure by selected categories are in the appendix as well.

Logit Regression Analysis

--Whole Population

I employed a hierarchical modelling strategy in the regression analyses. Independent variables were added to the regression equation one at a time. The variable was retained in the model only if the partial chi-squared test was significant at the .05 level.¹⁵ If the results indicated that none or only one variable was significant at .05, I relaxed the significance condition to .1. If a continuous variable did not pass the par-

Table 4.4

FREQUENCY OF PLANT CLOSURE BY ORGANIZATIONAL CHARACTERISTICS
RHODE ISLAND PLANTS WITH 50+ EMPLOYEES DURING 1977-83

Categorical Variables		All Plants			Single-Plant Firms			Plants in Multi-Plant Firms		
		C/N	%	Prob.*	C/N	%	Prob.*	C/N	%	Prob.*
Multi-plant firm	0	32/337	9.5%	.003	---	---	---	---	---	---
	1	44/242	18.2		---	---	---	---	---	---
Multi-plant owner	0	14/196	7.1	.001	14/196	7.1%	.032	---	---	---
	1	52/292	17.8		9/51	17.5		---	---	---
Non-RI HQ	0	48/424	11.3	.050	30/331	9.1	.191	18/92	19.6%	.791
	1	28/156	18.0		2/6	33.3		26/150	17.3	
Non-RI owner	0	43/325	13.2	.225	27/263	10.3	.158	16/62	25.8	.201
	1	31/175	17.7		4/12	25.0		27/158	17.1	
Acquisition	0	33/293	11.3	.011	21/223	9.4	.173	12/70	17.1	.600
	1	40/201	19.9		10/60	16.7		30/141	21.3	
Union	0	49/403	12.2	.311	24/267	9.0	.536	25/133	18.8	.942
	1	27/172	15.7		8/64	12.5		19/108	17.6	
20%+ workers unionized	0	50/420	11.9	.164	24/274	8.8	.327	26/143	18.2	1.000
	1	26/155	16.8		8/57	14.0		18/98	18.4	
Plant & firm diff. industry	0	54/434	12.4	.008	---	---	---	29/159	16.4	.164
	1	17/67	25.4		---	---	---	17/67	25.4	
Publicly-traded	0	55/464	11.9	.036	---	---	---	23/126	18.3	.814
	1	20/98	20.4		---	---	---	20/98	20.4	

* For Yates chi-squared test, the probability that the actual chi-squared is greater than the observed chi-squared, given that the null hypothesis is true.

Table 4.4 cont'd

	All Plants			Single-Plant Firms			Plants in Multi-Plant Firms		
	Mean Open	Mean Closed	Prob.**	Mean Open	Mean Closed	Prob.**	Mean Open	Mean Closed	Prob.**
Continuous variables									
Peak plant size	225	170	.179	137	116	.347	362	209	.057
Firm age	47	51	.283	43	44	.808	53	56	.564
Pct. US industry change	-14.4%	-17.7%	.115	-16.5%	-21.3%	.106	-11.4%	-15.0%	.195
Pct. unionized	23.0%	33.8%	.032	14.7%	24.8%	.107	36.0	40.0	.527

** For difference of means t test, the probability that the null hypothesis is true.

tial chi-squared test, I tried alternatives in the form of the variable squared, its square root, and its log.

The restricted model for the whole population of plants is presented in Table 4.5. (The global model is in the chapter appendix.) The influence of various plant characteristics as suggested by the restricted model is described in more detail below:

- o The expected probabilities of plant closure suggested by the restricted model for single-plant firms and for multi-plant firms (8.6% v. 17.5%) are very close to the actual frequencies (9.5% v. 18.2%).¹⁶ This seems to indicate that other factors interfere little with the influence of the multi-plant firm variable.
- o The firm age variable was significant in the model in the form "firm age + 1/firm age." Plants run by very young firms were the most likely to close. Plants belonging to firms between 20 and 40 years old were the least likely to close. The probability of a plant closure rose gradually for older firms. Figure 4.2 indicates the estimated probabilities of plant closure for firms of various ages.¹⁷ (Remember, the "firm" here can be a subsidiary or division.)
- o Acquisition was significant in the model as an interaction variable: $FPACQ*(1/\text{years since acquisition})$. The probability of closure was highest soon after an acquisition took place. The longer a plant survived after an acquisition, the more likely it continued to survive. (See Figure 4.3.)
- o Smaller plants were more likely to close than larger plants (Figure 4.4). This is a very interesting finding, given that the closure rate for multi-plant firms was so much higher than that for single-plant firms, and plants in the former tended to be much larger than plants in the latter. I will explore possible reasons for this result later in the chapter.
- o There was a direct relationship between employment trends in an industry nationally and the probability of closure of a plant in that industry (Figure 4.5).

REGRESSION PARAMETERS

Dummy Parameters

MULTI	Multi-plant firm = 1
MULT2	Multi-plant owner = 1
FPACQ	Firm or plant acquired = 1
NONRI	Non-RI HQ = 1
PFDI	Plant and firm in different industry = 1
PUBLIC	Publicly traded = 1

Continuous parameters

FIRMAGE	Age of firm
AGEINV	$1/\text{FIRMAGE}$
ACQINV	$\text{FPACQ} * (1/\text{years since acquisition})$
PEAKSIZE	Peak annual employment, 1977-83
SIZESQ	$\text{PEAKSIZE} * \text{PEAKSIZE}$
ICH7883	Pct. change in US industry employment, 1978-83
PCTUNION	Pct. plant workforce unionized

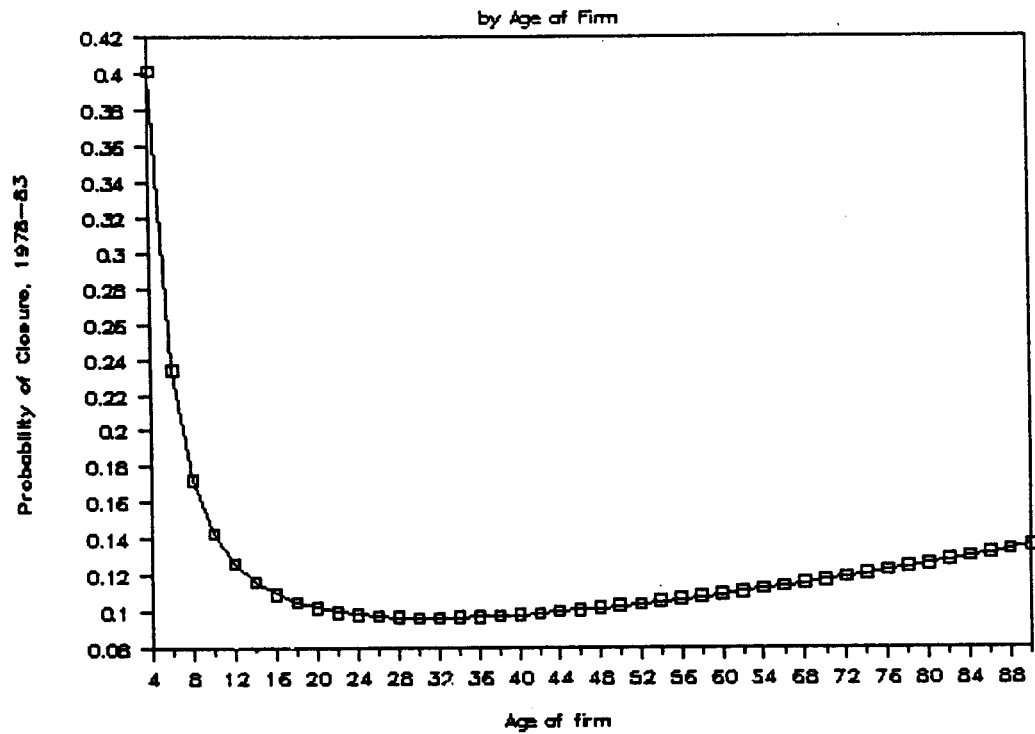
Table 4.5

RESTRICTED LOGIT REGRESSION MODELS FOR PROBABILITY OF PLANT CLOSURE,
WHOLE POPULATION

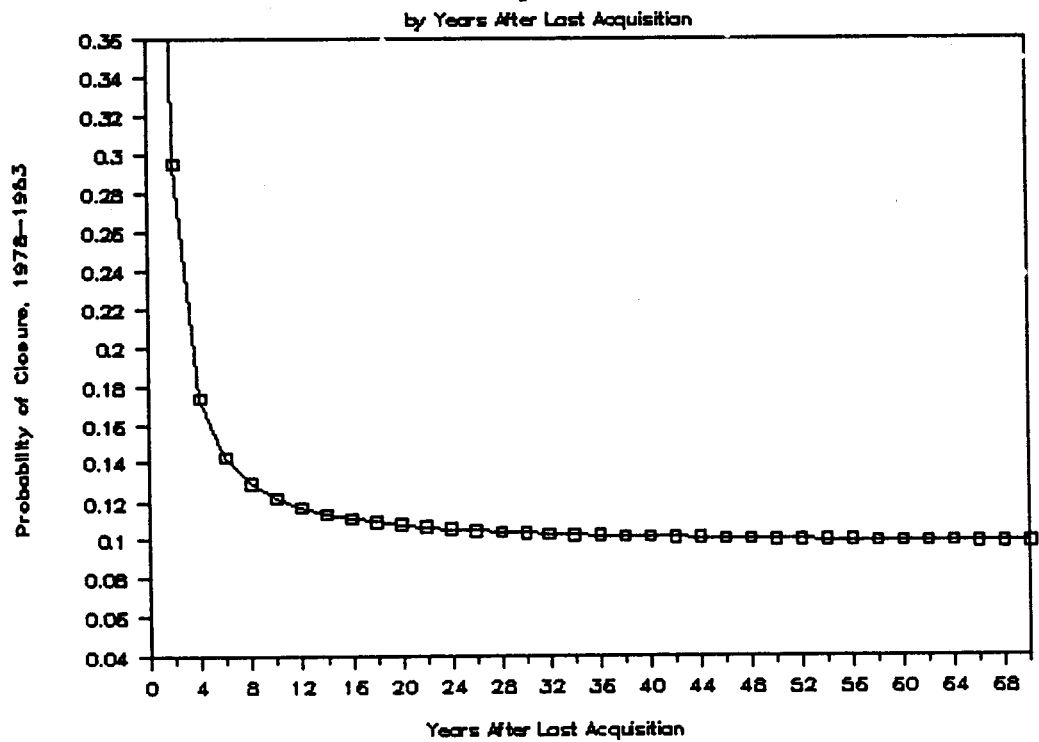
Cases	w/ MULTI		w/ MULT2	
	N		N	
Closed	483		446	
	72		64	
Parameter	Coeff.	t	Coeff.	t
CONSTANT	-3.242	-7.70	-3.969	-7.94
MULTI	.814	2.73	---	---
MULT2	---	---	1.147	3.30
FIRMAGE	.010	2.23	.014	2.92
AGEINV	9.666	3.62	10.977	3.72
ACQINV	2.760	4.04	2.611	3.73
PEAKSIZE	-.002	-2.22	-.002	-2.14
ICH7883	-.018	-1.98	-.021	-2.11
Chi-squared	50.2		55.6	

Figures 4.2 and 4.3

Probability of Closure



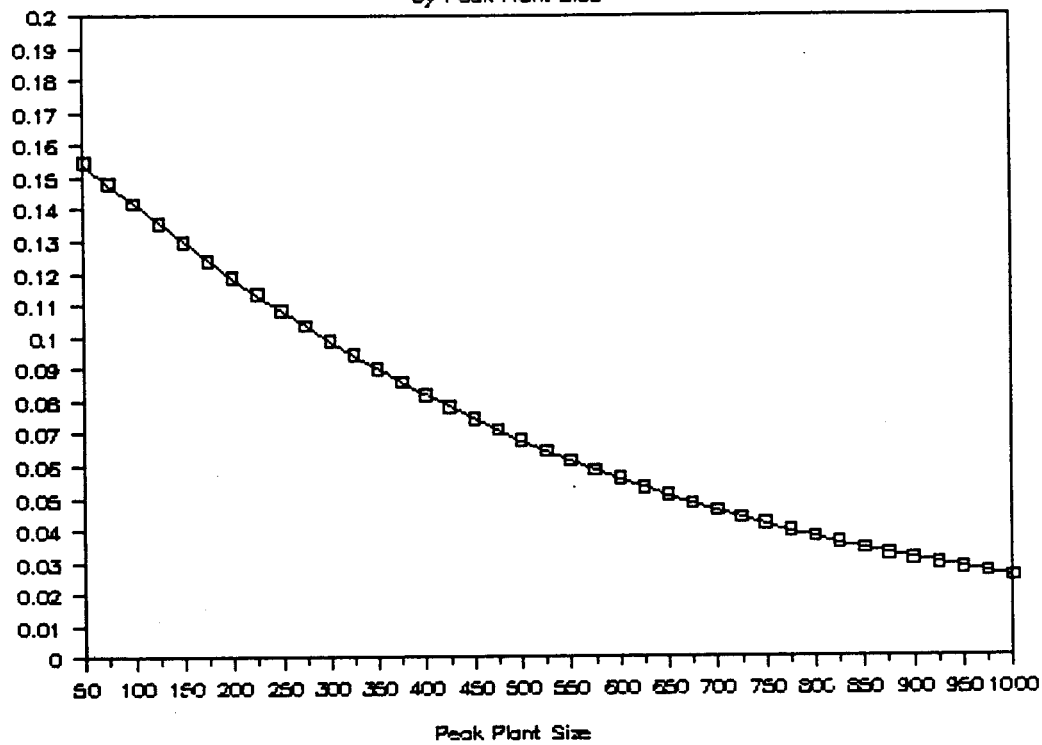
Probability of Closure



Figures 4.4 and 4.5

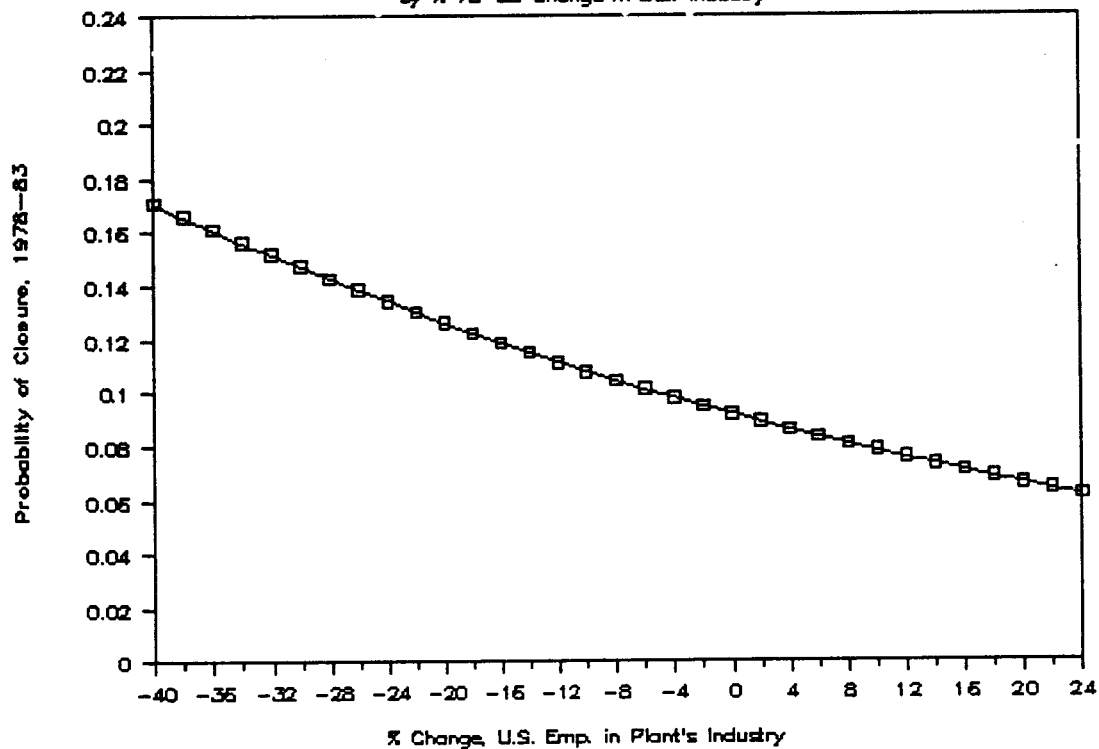
Probability of Plant Closure

by Peak Plant Size



Probability of Plant Closure

by % 78-83 Change in U.S. Industry



Characteristics whose influence did not have statistical significance in the logit regression analysis included non-RI headquarters, non-RI owner, union and percentage unionization, publicly-traded, and plant/firm industry difference. However, while the presence of one of these characteristics does not seem to increase the probability of closure, we will see that in particular closure situations each of these variables does play a role. Also, the act of acquisition per se was not significant--the element of time elapsed after the acquisition needed to be introduced.

The substitution of the multi-plant owner variable for the multi-plant firm variable brought about a restricted model with the same variables, with the one substitution. (To reiterate, multi-plant owners include multi-plant firms plus single-plant firms held by multi-firm owners.) Note that the coefficient for multi-plant owner is higher than for multi-plant firm, suggesting a larger difference in closure probability between single-plant and multi-plant owners than between single-plant and multi-plant firms.

--Regressions for Single-Plant and Multi-Plant Categories

Because multi-plant firm and multi-plant owner loomed as large influences on the probability of closure, I decided to construct separate logit models for each category within each of these variables, i.e. single-plant firms, multi-plant firms, single-plant owners, and multi-plant owners. The final results from each of these analyses are presented in Table 4.6. Each of the analyses yielded several significant variables at the .05 level, except for the single-plant owner analysis, which had one variable significant at the .1 level. A comparison of these four models and the whole population model yields a number of observations.

First, it seems that a major influence on the probability of a plant's closing is whether or not a plant was part of a larger corporate family. The difference in closure rates for single-plant firms and multi-plant firms was noted in the last section. In the model for single-plant firms, the probability of closure under a multi-plant

Table 4.6

REGRESSION MODELS FOR PROBABILITY OF PLANT CLOSURE
BY TYPE OF FIRM AND OWNER
Restricted Models

	SINGLE-PLANT FIRMS		PLANTS IN MULTI-PLANT FIRMS		SINGLE-PLANT OWNERS		PLANTS HELD BY MULTI-PLANT OWNERS	
Cases								
N	245		201		196		250	
Closed	22		42		14		50	
Parameter	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
CONSTANT	-6.950	-4.48	-2.594	-4.82	-5.009	-3.30	-3.229	-5.95
FIRMAE	0.0184	2.19	0.0144	2.38	--	--	0.0186	3.21
AGEINV	9.695	2.22	12.598	3.05	--	--	14.178	3.69
PEAKSIZE	0.0371	1.87	-0.0019	-1.92	0.0367	1.67	-0.00210	-2.13
SIZESQ	-0.00011	-1.70	--	--	-0.00011	-1.49	--	--
ICH7883	-0.0371	-2.03	--	--	--	--	-0.0224	-1.97
ACQINV	--	--	2.910	3.59	--	--	2.961	3.70
MULT2	1.052	2.00	--	--	--	--	--	--
Chi-squared	23.2		28.3		5.0		42.7	

owner was well above that for a single-plant owner. However, in the model for multi-plant owners, multi-plant firm is not a significant variable. In other words, there is no strong evidence that a single-plant firm of a multi-firm owner is less likely to close than is a plant in a multi-plant firm.

Second, the percentage change in the U.S. employment in the plant's industry is a significant variable for single-plant firms and for multi-plant owners, but, interestingly, not for multi-plant firms. This finding suggests that multi-plants firms might be more likely to close plants for reasons other than declining aggregate demand.

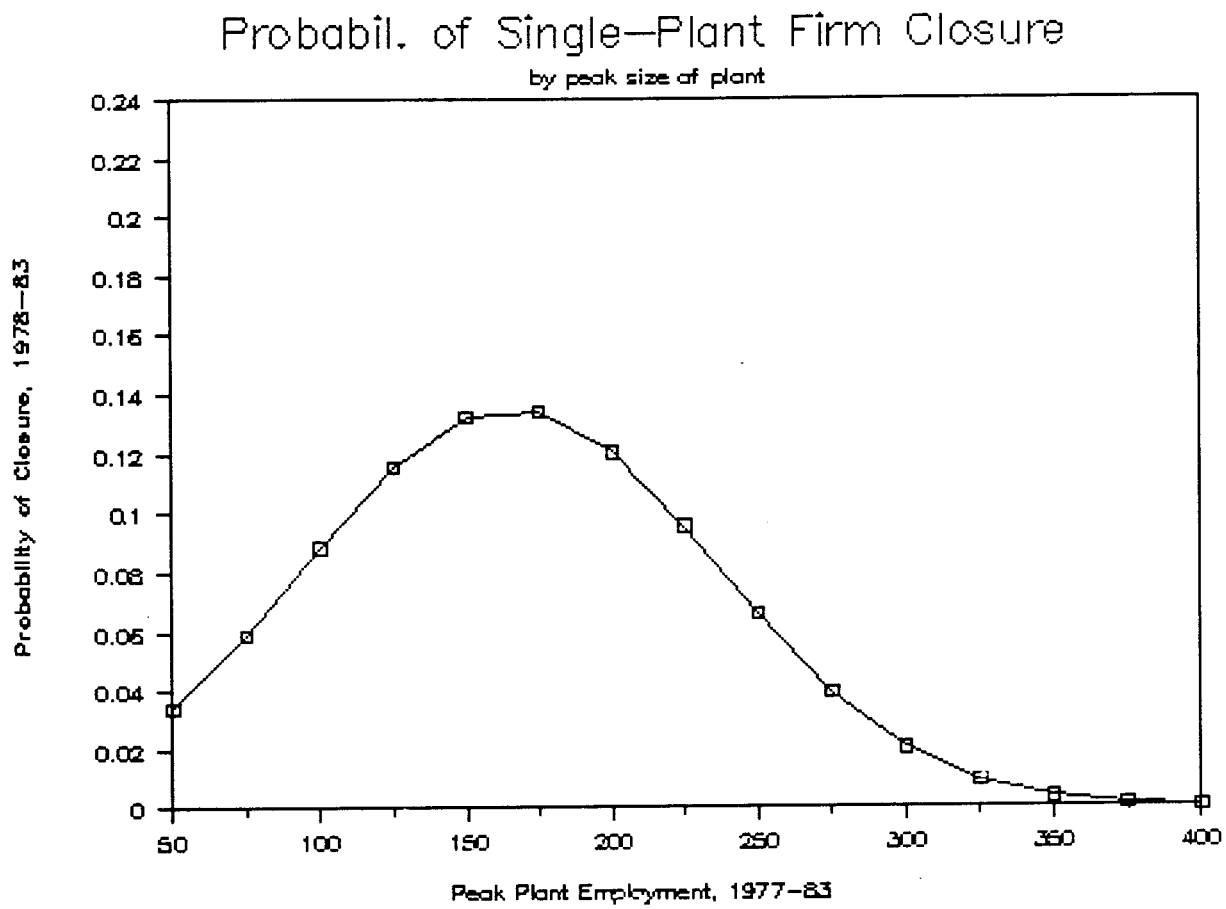
On the other hand, percentage employment change also is not a significant variable for single-plant owners (t statistic = -1.10). It may be that these plants are less sensitive to shifts in aggregate demand because it is their owners' only source of livelihood. A person owning several firms in different industries might be more apt to become overextended or to redeploy assets in bad times. These issues will be explored later in the chapter.

Third, because the single-plant owner analysis only yields plant size as a significant variable, and that at the .1 level, the significance of all the other variables in the single-plant firm model seem to be due primarily to the presence of the multi-firm owners in that category.¹⁸

Fourth, plant size is a factor in all the analyses. For plants belonging to multi-plant owners (whether firms or individuals), probability of closure falls with size (as in Figure 4.4). However, for single-plant firms, probability of closure rises with size between 50 and 175 employees (roughly) and then falls. (The variable is significant in the form "size + size squared." See Figure 4.6.) A similar pattern exists for single-plant owners.

Fifth, the acquisition interaction variable is significant in explaining closure for multi-plant firms and owners, in the same pattern as for the population as a whole. However, it is not significant for single-plant firms and owners.* While ACQINV had a

Figure 4.6



positive coefficient for both categories in the global models, the low t statistics may in part be a function of the relative infrequency of acquisitions for one plant firms--only one-fifth of single-plant firms were acquired.

Sixth, the effect of firm age is similar in all the regressions, with the exception of single-plant owners, following the parabolic pattern of Figure 4.1. The non-significance of firm age for single-plant owners is probably a function of the constraint of requiring 50 or more workers in a plant. The reader should remember that for age of firm, I may define "firm" as a subsidiary or division. Multi-plant firms and multi-plant owners would find it easier to start enterprises that reach 50 employees quickly than would single-plant owners. Single-plant operations started by owners without other operations would likely take some time to reach 50; moreover, the weeding-out process for these new firms primarily occurs at the below-50 level. Therefore, the number of single-plant owners of young firms is very small given that single-plant owners operate over half the plants in the data base. (Table 4.7).

As we can see, the regression models indicate that there appears to exist strong and complex relationships between organizational characteristics and plant closures. To recapitulate the findings so far:

- o If plant belongs to a multi-plant firm or multi-plant owner, it is twice as likely to close as is one belonging to a single-plant owner.
- o The probability of closure for a single-plant firms held by multi-plant owners is very sensitive to the percentage change in the industry's employment nationally. Closures of plants held by single-plant owners seem less sensitive to national changes. Industry employment change is not a significant variable for plants in multi-plant firms, but probably because plants close for reasons of decline in aggregated demand as well as for other reasons, such as availability of lower factor costs elsewhere.

Table 4.7

PLANTS IN FIRMS FIVE YEARS OLD OR LESS
by plant open/closed and type of firm

Type of Firm	Closed	Total	Closure Rate	% All Plants
Single-Plant Owner	0	2	0%	53.7%*
Single-Plant Firm/ Multi-Firm Owner	2	3	66.7%	11.9%*
In Multi-Plant Firm	4	6	66.7%	41.8%
Total	6	11	54.5%	100.0%

* Estimated

- o In multi-plant firms, probability of closure is inversely related to plant size. For single-plant firms, probability of closure rises from 50 to 175 workers, then falls.
- o The probability of closure increases greatly after an acquisition, then declines with time.
- o The probability of closure is inversely related to firm age (for multi-plant firms, "firm" may be defined as a subsidiary or division).
- o Finally, unionization, publicly traded stock, non-RI headquarters, non-RI owner, and plant/firm industry difference are not significant in any of the models, nor was acquisition as a categorical (i.e. yes/no) variable.

--Regression Models for Other Selected Categories

To further explore the nature of the relationships between organizational characteristics and the probability of closure, I also constructed logit models for particular subgroups (or regroupings) of the data base. These models are presented below. First, I examine patterns in the probability of firm closure. I was interested to see how the findings for firm closures compared to those for plant closures. Then, I build regression models for Rhode Island's two major industry groups, jewelry and textiles, both to determine the feasibility of industry-specific regression models and to better understand the dynamics of these particular industries. To further explore the effect of unionization and publicly-traded stock, which have not been significant variables so far, I construct a model for non-RI, multi-plant firms. Finally, I compare the effects of acquisition and family succession in independent businesses on the probability of closure.

Firm closures. Thirty-eight firms in the data base closed between 1978 and 1983.¹⁹ In this instance, by "firm" I mean the ultimate corporate parent of the plant. Interestingly, the two significant variables in the regression model for firm closures are non-RI headquarters and the acquisition interaction variable (Table 4.8). On reflec-

Table 4.8

RESTRICTED LOGIT REGRESSION MODELS FOR SELECTED CATEGORIES

Cases	Firm Closures*		Jewelry		Non-Jewelry		Textiles		Multi-Plant, Non-RI		Independent Privately-held**	
	N											
Closed	460		124		359		80		125		346	
	37		20		52		12		25		44	
Parameters	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
CONSTANT	-2.382	-11.92	-2.049	-4.12	-3.132	-6.95	-.727	-.87	-2.203	-5.81	-2.218	-8.42
NONRI	-2.238	2.94	---	---	---	---	---	---	---	---	---	---
INVFACQ***	3.198	3.17	---	---	---	---	---	---	---	---	---	---
ACQINV	---	---	5.604	3.17	2.399	3.17	---	---	2.724	2.77	---	---
AGEINV	---	---	7.814	1.59	8.929	3.62	---	---	6.533	1.70	---	---
PEAKSIZE	---	---	.003	-1.32	.002	-1.81	.017	-2.14	---	---	---	---
MULTI	---	---	---	---	.932	2.66	1.506	2.03	---	---	---	---
PUBLIC	---	---	---	---	---	---	2.578	1.63	---	---	---	---
FPACQ	---	---	---	---	---	---	---	---	---	---	.901	2.30
INDRELATE***	---	---	---	---	---	---	---	---	---	---	.188	.47
Chi-squared	19.8		17.5		31.7		11.6		9.5		5.3	

* In this model, the dependent variable is firm open/closed. In all other models, the dependent variable is plant open/closed.

** This is not a full model, just a comparison of the effects of two variables.

*** INVFACQ is FACQ*1/years since firm acquisition, where FACQ is a dummy variable for firm acquisition.

INDRELATE is a dummy variable for inheritance of independent firm by relative

tion, the robustness of the headquarters variable is logical. Thirty-five of the 38 closed firms were Rhode Island-headquartered. RI-headquartered firms tend to be 1-2 plant operations, while a good number of the out-of-state firms are national or multinational in scope. Standard wisdom and logic say that smaller firms are more likely to fail than larger ones. In this regression model, it seems that location of headquarters is really a proxy for firm size, a characteristic for which I could not get data.²⁰

Jewelry. The jewelry industry had 151 plants in the data base, 26% of the total. Eighty percent of these plants were in single-plant firms. The only variable significant at the .05 level in the jewelry regression model is the acquisition interaction variable. Note, though, that its coefficient in this model is twice as large as any other. The size of the coefficient is consistent with the dynamics of the jewelry boom and bust. When the industry took off, both newcomers and experienced jewelry people sought to enter the industry to cash in on the profits. The combination of falling demand and high interest rates resulted in a last-in, first-out effect. Eight of the 20 jewelry plant closures were post-1976 acquisitions. In fact, every jewelry plant of the five acquired in 1977 and 1978 closed by 1983.

After seeing the strength of the relationship between acquisition and closure in the jewelry industry, I wanted to see if the relationship held for non-jewelry firms. The logit regression model for non-jewelry firms indicates that acquisition remains an important explanatory variable.

Textiles. The textile industry had 83 firms in the data base, 12 of which closed. Significant variables in the regression model include multi-plant firm (direct relation to probability of closure), peak size of plant (inverse), and publicly-held firm (direct). The latter variable is significant because two of the seven textile plants in publicly-traded firms were relocated to new sites outside of the state.

The two industry models show how the dynamics of closures can dramatically differ from one industry to another and from the population as a whole.

Non-RI firms. While unionization and publicly-traded stock do not seem to be an important variables in explaining plant closure rates for multi-plant firms, I wanted to see if they are significant when the model is restricted to non-RI headquartered, multi-plant firms. Plants with workforces which are at least 20% unionized make up 48% of these plants (v. 19% for all other plants). Also, 65% of the plants in the non-RI multi-plant group are in publicly-traded firms. Again, though, neither variable was significant in the regression model. Acquisition age and firm age were the only two significant variables. When I further limited the sample to out-of-state publicly-held firms, the same results occurred.

Privately-held, independent firms. For privately-held, independent firms, the survey interviewers asked if the current owner was the founder, of the founder's family, or an acquirer. I was particularly interested to see if the probability of closure under succeeding generations tended more towards that for founders or that for acquisition. The coefficient for succeeding generation ownership was slightly positive and not significant. That for acquisition was robust.²¹

Descriptive Analysis: Patterns in the Characteristics of Closed Plants

The relationships between organizational characteristics and plant closures suggested by the various logit models demand some explanation or hypotheses. The explication of these relationships requires a descriptive analysis of the closed plants, a detailed examination of the nature of particular closings in terms of organizational characteristics, reasons for closure, and disposition of plant operations after closure. This type of analysis enables initial observations on the roles of institutional, structural and macroeconomic factors in plant closures.

For every closed plant but one, I was able to determine whether or not the firm itself remained opened or had closed. For the closed plants in open firms, the telephone interviewers asked a set of additional questions concerning the disposition of the

plant's operations after its closure. These questions covered (1) whether or not the firm continued to make the closed plant's primary product in another location, (2) whether or not the plant's operations were liquidated or relocated, and (3) if relocated, the advantages of the new location.

For 22 of the 40 plants in closed firms, I obtained specific information on the reason for the firm closure from persons who had long-term, first hand knowledge about the firm operation. This information was obtained in face-to-face interviews as part of my research for the Rhode Island Strategic Development Commission.²² For these and a number of other failed firms, I also gathered information from the clipping files of the Providence Journal.

Information on the disposition of plant operations and the reasons for firm and plant closure was extremely useful in gaining a more detailed sense of why certain variables are statistically significant and, very importantly, bringing to light trends not apparent in the models. For instance, although the extent of union presence is never a significant variable in any model, the descriptive analysis allowed me to see certain situations in which union presence seemed to stimulate the relocation of plant operations.

On reviewing the population of closed plants, I developed a typology of 4 categories of plant closures: firm closures (40 plants), product termination closures, i.e. the firm stops making the product (13 plants), capacity reduction closures, where the firm continues to produce the product elsewhere (10 plants), and relocations of plant operations for reasons related to factor costs (12 plants). I use this typology to structure the analysis.

--Firm Closures

The majority of plant closures (40) was due to firm closures (38). Firm closures also accounted for about half of plant closing job loss (Table 4.9). As we saw in Chapter 3, the job loss from firm closures rose very quickly between 1979 and 1983. The regression models for all firm closures and for the closures of single-plant firms indicate that five characteristics play important roles in the frequency of firm closures--multi-firm owners of single-plant firms, years since acquisition, industry employment change, plant size and location of headquarters (which I suspect to be a proxy for firm size).

The role of multi-plant ownership and size. As Table 4.9 indicates, the majority of job loss due to firm closures in the 1980-82 period came from closures of multi-plant firms and single-plant firms held by multi-firm owners. There seem to be two reasons for this pattern. First, as we saw, single-plant firms run by multi-plant owners were more likely to close than were other single-plant firms. Second, though multi-plant firms were not more likely to fail than single-plant firms, the plants in the former group tended to have larger employment. Only 2 of the 31 single-plant firm closures resulted in a one-year loss of more than 100 jobs. On the other hand, 5 of the 9 closures in multi-plant firms had this characteristic, with 2 plants with one-year losses of 500 employees each.

Of the 38 firm closures, all but three were headquartered in Rhode Island. As I mentioned earlier, I think that the non-RI headquarters variable in the firm closure regression model is really a proxy for firm size. Thirty-one of the firm closures were single-plant firms. Of the seven multi-plant firms, five were two-plant operations and one a three-plant operation. Only one closed firm was of any size, a publicly-traded, New York-based fashion conglomerate.

Industry. Seventy percent of the closed plants were in the jewelry, textile or apparel industries, with nearly half (19 of 40) in jewelry alone. This pattern is consistent

TABLE 4.9

JOB LOSS IN CLOSURES OF RHODE ISLAND PLANTS
 BY TYPE OF CLOSURE, 1979-82
 for plants with 50+ workers in one year between 1977-81

Type of Closure	Plants	1979	1980	1981	1982
Firm Closures	40	525	987	1,007	1,458
Single-Plant Firms	31	489	416	498	650
Single-Firm Owners	14	98	140	175	219
Multi-Firm Owners	9	90	125	68	366
# Firms Unknown	8	301	151	255	65
Multi-Plant Firms	9	36	571	509	808
Product Terminations	13	139	292	343	684
Capacity Reductions	10	281	42	120	455
Factor Cost Reductions	12	341	339	592	704
TOTAL	76*	1,286	1,669	2,062	3,310

Note: Job loss in each year counted for firms which closed in last six months of prior year, base year and subsequent year. Figures for 1983 not included because identification of 1984 closures not available.
 Counts in "Plants" column for plants which closed 1978-83.

* Includes one plant which closed in 1983, with no job loss in prior years, and for information is lacking to place in category. Therefore, "Plant" column adds to 75.

with the dominance of jewelry and textile plants among small RI-headquartered firms and with the fact that both the jewelry and apparel industries underwent a nationwide shakeout during the 1978-83 period.

I think the fact that firm closures provided over half of the state's plant closures is very much a function of the large numbers of small jewelry firms. States with an industry structure more oriented to larger firms would be less likely to have such a high proportion of job loss resulting from firm closures.

Management and acquisition. From information I have for 24 of the 38 closed firms, it seems that a large number of the closures were the result of management problems. Failures due to mismanagement can be broken into three groups--one in which healthy companies were acquired and then poorly run by new owners, one in which relatively young companies failed, and one in which long-term owners made management errors.

For eleven of the firm failures, acquisition and mismanagement are clearly associated. One of these is the above mentioned conglomerate, which acquired one of the premier Rhode Island jewelry companies in the early 1970's to be its flagship subsidiary. A decade later, the entire company went down due to mismanagement at the top and at the subsidiary. The ten remaining acquisition-failures all failed within 3 years of being acquired. In five of these, the firm failed after being sold by conglomerate ownership to the subsidiary's management. In four conglomerate-related cases, a Rhode Island-based single-plant firm was acquired by an out-of-state conglomerate in the late 1960's or early 1970's; in the late 1970's, the conglomerate decided to sell to the subsidiary's management because it was no longer profitable or profitable enough.²³ In the fifth case, soon after a Swiss venture capitalist started a watch case firm, his mismanagement forced him to sell out to the local people.

For most of these conglomerate-related cases, I do not have enough information to comment on the quality of the new management, though one might suspect their

judgment in buying the companies in the first place. In one case, though, I was told that after two brothers took over the company, one of them actually stole the firm's cash and went to Mexico.

In the second group of acquisition-failures, apparently healthy companies were taken over by inexperienced local management. One small jewelry company was acquired by two marketing executives from a multimillion dollar corporation in a related but different field. Their lack of operational experience doomed the firm. In a second case, lack of management experience was compounded by the new owners' inability to work with a union which had coexisted with the prior owners. Badly handled confrontations led first to a strike, then to violence, then to bankruptcy. In another acquisition-failure, the new owner's drinking and gambling problem played a large part in bringing about the result. A 2-plant jewelry company failed within a year of being acquired because the new and inexperienced owners highly leveraged their acquisition at the time of 21% interest rates and the fall in jewelry demand.

Of all the firm closures, only three were firms which started and failed under the same owner within 10 years. Both firms for which I have good information failed apparently because they over-expanded, making investments in plant and equipment that could not be supported. In one case, a jewelry company, the owner failed to understand his cost structure. For the other, a fish processing plant, management failed to properly arrange for an adequate supply of fish, not understanding how the local fisherman operate. The firm died in two years.

Twenty-four of the firm closures were operated by families which had owned the firm for at least ten years. However, at least four of these instances look like some of the acquisition-failures. In three cases, sons were unsuccessful in taking over from fathers. In the fourth case, the long-term owner of a fabricated metals plant died without a successor, and his estate was unable to find a buyer. Just before the owner died, the workers voted to unionize. Facing tightening markets, the caretaker manage-

ment and the union were unable to come to contract agreement. A ten-month strike ensued which ended only when the estate, unsuccessful in finding a buyer, decided to liquidate.

In a number of instances, long-term owners did not seem to have the skills to maintain profitable operations. One had made his fortune on a particular type of fad jewelry, but did not diversify his product line once the firm faded. In a printing business, management was too rigid and traditional to respond to new industry trends; it closed after over 100 years of operation. In a third case, another jewelry maker over-expanded, building a new plant just as the jewelry boom faded. Several of the single-plant firms in this group belonged to multi-firm owners. Perhaps some of the owners were too extended to manage their business properly; perhaps others were not sufficiently motivated to save their business because it was not their only source of livelihood.

Three of the firms in this group, and for which I have no information on management quality, were in women's apparel. Without excluding the possibility of management problems, there also seems to have been structural changes in that particular industry that may have brought about their demise. Persons knowledgeable about the local apparel industry indicate that a number of small contract jobbers, such as these single-plant firms, closed when the buyer decided to shift the contract to off-shore sources. As we saw in Chapter 2, apparel was the only major industry group in Rhode Island that paid wages above the national industry average.

Only for one firm could I find information that the closure was purely voluntary--the owner wanted to retire, could not find a local buyer, and so shut the firm and sold the assets outside the state.

The role of institutional and structural factors in firm closures. It appears that most of the Rhode Island firm closures occurred for institutional reasons, particularly mismanagement. External macroeconomic and structural events, such as the decline of

jewelry demand and the appearance of low-wage foreign entrants, may have exacerbated difficulties to the point of failure, but for the most part the problem seems to have been within.²⁴ In clear and rich detail, we can see the role of inexperienced new management and poor judgment by old management. Moreover, given the high failure rate of single-plant firm held by multi-plant owners, it may be that a single person running a number of separate firms results in overextension and poor management.

Conglomerate ownership seemed to have played a key role in a number of firm failures, at one remove from the final owner in all but one case. It is difficult at a distance to tell whether and how much the conglomerates' contribution to these firm failures was through willful "milking," lack of experience, or the bureaucratic transaction costs that conglomerates can impose on their subsidiaries. The repeated pattern of acquisition, divestiture and failure is both striking and quite similar to conglomerate-generated job losses described elsewhere.²⁵ It is important to note that in each case, the conglomerate's own on-site management took over the firm. It may be that in one or two cases significant management problems existed within the subsidiary instead of or in addition to problems from above.

Pointing the finger at management for Rhode Island firm failures does not mean that structural and macroeconomic issues had little to do with the ultimate result. The regression models do indicate a robust correlation between change in industry employment and single-plant firm closures.²⁶ Basically, I think there is a tension between the macroeconomic, structural and institutional factors that varies from industry to industry, firm to firm, region to region, the top to the bottom of the business cycle, and one fad in corporate conglomeration to another. For instance, the high proportion of closed Rhode Island firms with clear institutional problems was in large part a combined function of the boom/bust in jewelry demand and the structure of the jewelry industry, which is primarily comprised of small firms. The boom encouraged many inexperienced people to enter the business and those in the business to expand; when the

decline in demand occurred, those that could not adjust closed up. Changing industry structure or technology, or the massive inflow of imports did not appear to play a major role in most of the jewelry failures. Bad timing and inexperience did.

In other industries, times and places, structural problems may more directly dictate firm closure, regardless of institutional ability. For instance, in the Rhode Island-Massachusetts textile industry of the 1950's, changing tastes, new products, and the availability of lower-waged labor in the South meant that many small manufacturers had little choice but to liquidate, unless they wanted to move South also. That was a institutional choice many did not want to make. Today, apparel contract shops find their opportunities significantly narrowed as buyers switch to foreign sources. Ultimately, I think, all firm failures have institutional roots--owners and managers fail or decide to stop trying. Trends in aggregate demand, currency rates, and industry structure and technology set the environment. However, in many instances the room to move is very narrow.

To put it another way, firm failures appear to be the results of institutional reactions to structural and macroeconomic opportunities and constraints. I believe this perception holds for other types of plant closures as well.

--Product Termination Closures

Thirteen plants were shut down as a result of a firm decision to get out of the business of making the plant's product. Unlike the firm failures, 6 of the 13 closed plants in this group were operated by non-Rhode Island firms. Only 3 plants were unionized. The mean peak size of these plants was slightly larger than that for the firm failures (176 v. 146). Six plants had under 100 workers, 4 were over 235.

In 11 of the 13 product termination closures, the liquidated product was tangential to the company's primary product line. For 8 of these firms, the parent made a decision to enter a new market, either vertically or horizontally related to its

primary business, but after a few years determined that the venture was not working and closed the plant. In all cases, the company ran the plant for 8 years or less; in six cases, it ran the plant 5 or less years. Four of the 8 were startup plants and four were acquisitions. In only 1 of the 4 acquisitions did the new owner acquire a troubled company, one that had been in Chapter 11 for 5 years. In at least three acquisitions, the parent decided the acquisition did not fit with the rest of the firm. In several others, firms misjudged the nature of the new market they were entering; one of these firms also decided it did not like or understand the jewelry industry culture. And a few were simply mismanaged. Again we see that new acquisitions and newly created "firms" (in the form of subsidiaries) in businesses in which management lacks experience or adequate knowledge are more likely to close than are other plants.

In two other cases of tangential product termination, the company decided to eliminate a traditional product line during a period of company turmoil in which management problems played a part. Both companies had produced their respective product lines for quite some time. For one of these plants, a Brown and Sharpe cutting tool operation, a long-term conflict with the union compounded the company's problems.

There were two product termination cases in which the plant product was not considered tangential by the parent. One company closed its Rhode Island plant when that plant's product, dry felt for asphalt shingles, became obsolete. The firm, which had run the unionized RI plant for 75 years, closed several such plants around the country. The company replaced these plants by expanding production of the replacement product, fiber-glass shingles, in a new South Carolina plant and a converted Massachusetts one.

The last case of product termination was more akin to a firm failure. A 76-year old manufacturing firm whose primary product was handbag ornaments shut down the

handbag plant after failing to change its styles with the times. It did retain a small plant that made medallions.

According to personal interviews, news articles and the survey respondents, institutional issues played a large role in product termination closures. That nearly two-thirds of these closures were in-and-out operations in new product lines again indicates the role of inexperience or misjudgment in bringing about plant closures. Management problems also seemed to be present in the three product termination closures under long-term management, including the handbag and cutting tool plants.

However, there also appear to be a few product termination closures in which a measured decision was made to redeploy assets in response to structural industry trends. In one, vertical integration no longer made economic sense, so the plant was dismembered and the assets sold. In another, it was decided to redeploy assets in another part of the industry. The product obsolescence closure was brought on by technological change. Finally, for a microwave components plant, the appearance of low-cost Japanese products meant that it was no longer economically viable.

I did not expect to find such a high proportion of closures which were product terminations--17% of the total. It would be interesting to see if this proportion is replicated in other areas.

--Capacity Reduction Closures

Ten plants closed when companies decided to reduce (but not eliminate) production capacity in an existing product line in the face of falling demand. In all cases but one, operations were consolidated into other existing plants. The consolidations had a regional flavor--five were with sister Rhode Island plants, and 2 with Massachusetts plants, and only 2 with plants outside the New England region. Six of the 7 intra-regional consolidations had less than 110 workers.

Five plants in three firms were closed as the result of a decision to consolidate operations with another Rhode Island plant.²⁷ Two RI-headquartered firms (jewelry-related, publishing) closed three plants and one out-of-state firm (luggage) closed two. All five plants were acquired 7 or less years prior to closure. One of the firms, which made jewelry-related items, acquired two subsidiaries from two different conglomerates. One source suggests that the acquirer had management problems and became overextended in the recession of the early 1980's. A third plant closure took place in the aftermath of a merger between two printing companies.

In two cases, an Indiana conglomerate that focussed on making hospital beds took over a Rhode Island-based manufacturer of luggage which had 5 local plants. Soon after the acquisition, demand for the product declined an estimated 20%, requiring liquidation of some capacity. Imports' share of the U.S. luggage market rose from 20% in 1977 to 38% in 1983.²⁸

Two plants lost to consolidation were operated by small Massachusetts-based companies (apparel, jewelry) which moved the Rhode Island operations into the headquarters plant when product demand fell. Both plants had less than 70 people. They were the only 2 plants in the capacity reduction group which were startups by the parent.

Finally, three plants were closed by non-regional firms as the result of decisions to reduce excess capacity. Two were cross-country plant consolidations (to Minnesota, New Jersey). Both plants were quite larger than the others, averaging 300 workers each. One survey respondent, now in a middle management position with another company, told us that the parent of the closed plant, which had acquired the Rhode Island subsidiary 20 years earlier, did not invest much in plant and equipment and essentially had "milked" the plant. (The parent had diversified holdings in the same major industry group, food processing, as the plant.) The stated reason for the other capacity

reduction/relocation was a drop in aggregate industry demand for computer terminals.²⁹

The last case in this category is more akin to a firm failure. The largest producer of kitchen cabinets in Spain set up a subsidiary in Rhode Island to produce for the U.S. market. However, the product was never test-marketed, there were communication problems between Spanish managers and local workers, and the plant site was too far from markets. The plant only lasted 2 years. Unlike the other capacity reduction closures, operations were not consolidated with an existing plant. The company defaulted on the mortgage and the mortgagor took title to the plant and equipment.

Consistent with patterns in prior categories, at least a few of these consolidations can be attributed to management problems. One jewelry firm made an acquisition in 1980, not the best time to do so--the plant closed in two years. It also was unable to sustain production in an earlier acquired plant that made a tangential product. The possibility of management issues at the food processing plant has been mentioned. For a number of capacity reduction closures, I have no assessment of management performance. However, it is clear that, for at least a few plants, structural factors did play a role, in jewelry, apparel, luggage and office equipment.

It is unclear what conclusions can be drawn from the predominance of capacity-reducing consolidations to local plants. Perhaps such local consolidations are more likely to take place than cross-country ones for logistical reasons. Perhaps their predominance is a combination of the structure of the Rhode Island economy and coincidence.

Finally, it appears that in almost every case of capacity reduction, some portion of plant operations were consolidated into an existing plant in the same product line. For companies that retain a closed plant's product line and geographic market, perhaps partial rather than complete liquidation is the norm. After all, reduction in demand does not necessarily coincide neatly with a plant's capacity; moreover, a company prob-

ably would want to keep some capacity if an upturn occurs. Only studies of other areas can indicate whether this pattern is replicated.

--Relocations and Consolidations to Reduce Factor Costs

Profile of closures. The remaining 12 plants all seem to have had their operations relocated to new plants (6) or consolidated with existing plants (6) for the purposes of reducing factors costs. Significant reductions in capacity were not involved. Four closures appear to have been made primarily for labor-related reasons, 4 for physical site reasons, 2 primarily to reduce energy costs, and 2 to reduce transportation costs. All but one were non-RI headquartered and acquired. Most of the plants were fairly large. Average peak plant size was 270 workers, with the largest being 600 and the smallest 56.

Four plants moved to escape unions and to lower labor costs. Each of these plants were larger than average (the smallest being 190 workers) and were moved to low-wage locations--South Carolina, Alabama and Mexico. Three had production workforces which were 100% unionized. The one non-unionized plant belonged to General Electric--however, with a sister Rhode Island unionized plant, its workers were paid union scale. General Electric publicly admitted that its reasons for moving both plants (wiring devices) to Mexico was to lower labor costs in light of industry trends. One GE plant was the largest closure in the 1978-83 period.

A plant closure by Davol, a maker of latex products for health care, illustrates a pattern of acquisition and relocation that is repeated by several other plants. Founded in Rhode Island in 1874, Davol was acquired in 1968 by the International Paper Co., organized by the United Rubber Workers in 1970, and experienced an eight-week strike in 1970 and an 18-week strike in 1973-74.³⁰ In the aftermath of the strike, the company announced that it would no longer expand in Rhode Island because of the state's unemployment compensation costs and a law which provided unemployment insurance

benefits to strikers after 7 weeks of strike. The company acquired its South Carolina plant in 1977 and closed one Rhode Island plant the next year. (It continues to operate another Rhode Island plant.)

Parenthetically, one telephone respondent from the group of plants that relocated for labor-related reasons said that he regretted the move because the firm was unable to maintain the same product quality as in Rhode Island.

Four respondents said that plant operations were moved for reasons of physical plant--to gain larger plant capacity, better plant layout, or lower rent. All moved to Northeast locations. Two plants were consolidated into existing plants within three years of being acquired. One was moved into a new plant built near corporate headquarters seven years after the Rhode Island-based firm was acquired. Finally, one plant, a textile subsidiary of large nationwide conglomerate, moved to Pennsylvania after a dispute with the Rhode Island government over plant rental costs. Three of these plants were non-union; the four was 60% unionized.

Two plants were primarily shut down for energy reasons. The Narragansett Brewery was consolidated with a Falstaff Beer operation (its parent) in Indiana because the brewery could not get a guaranteed supply of natural gas and refused to operate with more costly oil.³¹ In the second case, a bottling plant's Pennsylvania-based parent went bankrupt and was taken over by a Canadian conglomerate.³² However, soon after the acquisition, the Canadian firm decided to close the plant for reasons, it told the press, of high energy and transportation costs. Operations were consolidated with a West Virginia plant where energy costs were one-third as much.

Finally, two plants were moved for reasons of distance to markets. One was the only RI-headquartered company to move a plant out of state. The single-plant company went into Chapter 7 bankruptcy within 6 months of moving to New Jersey. A source draws a familiar picture--a son took over the business from his father but had trouble maintaining operations. The business was said to be highly undercapitalized.

The Davol plant closure is a case of an established Rhode Island company being acquired and then having operations moved. The final case shows that the same pattern can occur for a new local company as well. Technical Fluorocarbons Engineering, Inc. (TFE) was founded in 1965 by two Rhode Islanders and acquired two years later by Dayco Corp. as part of its Cadillac Plastics division. In 1976, TFE headquarters were moved to Kalamazoo, Michigan, site of a second TFE plant. In 1980, TFE decided it wanted a consolidated operation at a centrally located site, so it built a new plant in North Carolina and closed both older plants.

A Teamster representative said to the survey interviewer that while labor issues were not the primary reason for closure, they were at least secondary. Soon after TFE moved its headquarters to Michigan, TFE workers in Rhode Island voted to join the Teamsters. In 1977, a National Labor Relations Board judge ruled that TFE had engaged in unfair labor practices by coercively interrogating employees about union sentiment and offering them raises in exchange for not supporting the union.³³ When the closure announcement was made in 1980, TFE's president said that while Rhode Island was not chosen as the consolidation site because of its peripheral location, North Carolina was chosen both for reasons of location and its "total pro-business climate."³⁴

All eleven non-RI headquartered plants which were relocated for factor cost reasons were acquired. In prior categories a large number of plants were closed within 5 years of acquisition because the new owners could not adequately adjust to their new responsibilities. However, for this group, 7 of the plants were held for 5 or more years, and 6 for 10 or more. For these relatively long-held plants, the decisions to close seem more measured, a proactive attempt to adjust to changing market conditions by lowering the costs of the factors of production. Four plants were acquired and moved in 3 years, one for labor reasons, two for physical site and one for energy. In these cases, the relocations seemed to be made as the companies began operating the plants, better understood their cost structures, and made locational adjustments.

There is clear evidence that the dynamics of the geographic dispersion of production capacity for labor-related reasons was at work in several cases. At the same time, for the majority of these relocations, it seems that non-labor factors were the motivating force.³⁵

Roughly one-quarter of plant closing jobs loss was due to relocations and consolidations for reasons of factor costs. For the 1978-83 period, 4%-6% of annual gross job loss (i.e. closures and contractions) can be attributed to this type of closures. As we saw, all but one were non-RI headquartered plants. In fact, while only 0.23% of RI-headquartered plants (1 of 425) had plant operations fully transferred to another location, this occurred for 7.1% (11 of 156) of all non-RI headquartered plants, a difference in frequency of a factor of 33.

Comparison of relocation findings to those of David Birch. One of David Birch's key findings in "The Job Generation Process" is that job loss due to plant relocation is almost negligible:

Virtually no firms migrate from one area to another in the sense of hiring a moving van and relocating their operations. The oft-cited move of textiles and shoes from New England to the South represented a rare fluke in the 1950's, not an example of a significant process today.³⁶

Birch supported his assertion by data that show that in the years 1969-76, the annual rate of job loss due to relocation was between .03% and .1%. His figures were for all types of businesses--he did not publish national figures for migration of manufacturing plants. This was not a trivial omission, for the migration of traded sector firms is the important figure. Birch's published migration data for manufacturing at the state level show substantially higher migration rates. For Rhode Island manufacturing, the annual job loss rate for the 1969-76 period was between .1% and .3%. However, he went on to say that even the higher levels of migration in particular areas overstate the problem:

A careful look at the firm migration figures reveals a great deal of clustering. . . . Most of these (migration) moves . . . are relatively short-distance

moves. If we draw the boundaries around greater metropolitan areas rather than around states, most of the migration vanishes.³⁷

In light of findings that factor cost relocations and consolidations provided one-fourth of plant closing job loss and 4-6% of annual gross job loss, I believe that Birch underestimated the importance of the relocation phenomenon. Translating the relocation job loss figures to a form comparable to Birch's, I estimate that in the 1979-83 period between .3% and .8% of RI manufacturing jobs were annually lost to the movement of operations outside of the state. Though these figures are not very large, and are for a different time period, they do suggest that relocation is more widespread than Birch indicated. Three methodological reasons and an observation about Rhode Island's economic structure support this notion. First, as Birch notes, the DMI file undercounts relocations. In response to the relocation of operations to a new plant, Dun and Bradstreet frequently does not bother to transfer the old DUNS number, in which case the relocation is not counted as such. Rather it is treated as a death in one place and a birth in another.³⁸ Second, and very importantly, the DMI file only picks up relocations to new plants. It does not count the consolidation of plant operations into existing plants. However, half of the RI plant operations moved to reduce factor costs were of this latter type.³⁹ Third, whereas Birch's figures include intra-metropolitan area moves, mine do not. Perhaps one reason why intra-city moves are so well represented in Birch's migration data is that in such cases only one D&B office is handling the relocation of the account. For inter-regional moves which require the coordination of two D&B offices, the old DUNS number is more likely to fall through the cracks and the relocation missed. In sum, it does not seem that the DMI file provided a very accurate count of job loss due to relocation and consolidation.

The Rhode Island data probably understate the extent to which the movement of plant operations occurs in other states. Nearly 75% of the plants with 50+ workers were RI-headquartered. However, we saw that non-local firms were far more likely to

move operations than were local firms. In states which are more dependent on branch plants than Rhode Island, job loss due to relocation of operations likely would be higher.

Review of Hypotheses in Light of Findings

The series of logit regression models has indicated that certain variables are significant in explaining the probability of Rhode Island plant closures. The descriptive analysis of the closures has provided a deeper understanding of the relationships between a number of organizational characteristics and plant closings. Using the results from both the logit and descriptive analyses, I can now review the hypotheses set out in the beginning of the chapter regarding these relationships.

Multi-plant firm and multi-plant owner. Contrary to popular wisdom, the logit analysis indicates that plants held by multi-plant companies were twice as likely to close as were single-plant firms. The primary reason for this result is that a single-plant firm is more "lumpy" than plant in a multi-plant firm. As was apparent in a number of closures, when capacity is significantly reduced in a multi-plant firm, whether to cut down on excess capacity or to stop making a tangential product, a plant might close. On the other hand, capacity reduction in a single-plant firm means a layoff, not closure.

The frequency of closure for single-plant firms held by multi-firm owners looked like that for plants in multi-plant firms. For every firm closure under a multi-firm owner for which I have evidence (all but 2), it is clear that management problems are at fault. As said earlier, perhaps multi-firm owners get overextended or have less personal investment in an individual business because their income comes from a number of sources.

Non-Rhode Island headquarters. I think it is plausible that the non-RI headquarters variable was not significant because it had two very strong, but opposite,

tendencies that cancelled each other out. On the one hand, out-of-state firms were far more likely than locally-based firms to move operations out of state. On the other, local firms were far more likely to fail.

When all movements of plant operations to out-of-state locations are counted, including those involving capacity reductions, only 0.23% of RI-headquartered plants were moved versus 9.6% of non-RI headquartered plants (15 of 156). A plant with out-of-state headquarters was over 40 times more likely to relocate or consolidate out of state than was a plant with in-state headquarters.

These startling results probably can be explained in part by two facts. First, the plant operations of almost every Rhode Island-headquartered firm were solely or predominately based in the state. Second, almost every Rhode Island firm was in the 1-3 plant range in size. It seems plausible that local owners would be very reluctant to move a facility out of state since they either would have to move too or create a new management style that did not involve on-site oversight. A number of the sources interviewed for the Greenhouse study noted that many of the small firm owners were attached to their businesses for social reasons, e.g., standing in the community, membership in the country club. Out-of-state firms with RI plants would be much less likely to let the social attachments of their Rhode Island managers rule out a relocation.

The results make a strong statement about the geographic stability of and the role of non-business factors in the siting decisions of small, locally-owned manufacturing businesses. However, it is unclear the extent to which relocations by in-state firms did not take place because the firms were local and the extent to which the result occurred because the firms were small.

While only 1.5% of non-RI headquartered firms failed, 8.8% of RI-headquartered ones did. As I mentioned earlier, I believe that these results are more a function of firm size than of location. Rhode Island is a state of small local firms. In a state with larger local-headquartered plants and firms, there may be a lower rate of in-state firm

failure. It would be interesting to see if there were an off-setting higher rate of out-of-state relocation by in-state firms.

Years since acquisition. Years since acquisition had a very powerful influence on the probability of plant closure. There seem to be two types of reasons for this--management error and quick adjustment. A large number of plants closed soon after acquisition because the new owners wither were unable to maintain profitability or, for tangential plant acquisitions, soon realized they had made a mistake. In addition, several plants closed soon after acquisition when their managements chose relocation as the method to absorb the new operations into the firm.

Interestingly, the act of acquisition itself (i.e. as a categorical variable) was not significant in any model. This result further indicates that the impact of acquisition on closure is very much related to time.

Firm and plant size. When I designed this study, I did not have a variable for firm size because the information was difficult to obtain for firms with out-of-state operations. However, the regression model for firm closures indicates that, if one accepts location of headquarters as a proxy for firm size, that small firms indeed are more likely to close than large ones.

The regression models indicate that the relationship between the probability of plant closure and plant size depends on the number of plants in the firm. The probability curve for multi-plant firms is negative-sloping--smaller plants are more likely to close. The curve for single-plant firms is bell-shaped, rising between 50 and 175 workers and then falling.

I think that three factors can explain the negative sloping curve for multi-plant firms. First, when a firm chooses to reduce capacity, smaller plants logically would close before larger ones making the same product. If there is a consolidation, a smaller operation has to fit into a larger one. Drops in sales may be only severe enough to call for the liquidation of a small plant rather than a large one. Also, closure of a smaller

plant allows a company more flexibility to respond if sales rise again. (Of the 9 plants closed to reduce capacity, 6 had less than 110 workers.) On the other hand, if cutbacks need to take place within very large plants, it is less likely that the whole plant would close. While the largest closed plant had 600 workers, there were 38 plants that were larger. We see that "lumpiness" has a role in lowering the probability of closure not only for single-plant firms (which tend to be small, but also for plants at the far end of spectrum.

This dynamic might not be replicated in states, like Ohio and Pennsylvania in the late 1970's and early 1980's, hard hit by restructuring in durable goods. However, the frequency of large plant closures in such limited time and bounded space has been a rare occurrence in U.S. industrial history.

Perhaps a second reason for the downward sloping curve is that the quality of management in small firms might not be as good as that in large ones. Of the plant closures in multi-plant firms involving less than 110 workers, the majority were in small regional companies. Third, small plants might be more likely to close for reasons of economies of scale. For certain industries, small plants are less efficient than larger plants. If cost differentials become more important, smaller plants would be more likely to close.

A bell-shaped curve relating probability of closure to plant size occurs both for single-plant firms and for single-firm owners--the coefficients for plant size are almost identical. So for this variable the influence of multi-firm owners is not profound. Perhaps firms in the 100-225 range of employment are more susceptible to being closed because they are at the outer edge of the range in which non-professionally trained, family-type management can be successful without a broad and deep skill base. A number of the firms in this range appeared to close after outsiders or sons took over, or as smaller jewelry companies expanded during the boom.

Firm age. Except for single-plant owners, very young firms were more likely to close a plant. Remember that for this variable, the "firm" may be the subsidiary or division of a larger company. Of the 7 plant closures with firm age less than 10, 4 were parent firm startups of a single-plant corporate subsidiary and 2 were startups of single-plant firms by multi-plant owners. Only 1 single-plant owner (of 11) failed with less than 10 years firm age. Thus, for plants with 50 or more employees, it was not newness and inexperience per se, but corporate expansions coupled with management problems that seemed to lead to a quick closure. However, I am missing the relationship between firm age and closure for the smallest firms.

Percentage change in industry employment. In the regression models, percentage change in industry employment is a significant variable only when multi-plant owners of single-plant firms are included in the sample. As mentioned earlier, it is likely that the variable is not significant for multi-plant firms because they close plants for reasons other than declining demand, e.g., relocating to lower factor costs or getting out of a product line entirely to make a better rate of return in a different investment.

Multi-plant owners of single-plant firms may be more sensitive to aggregate demand changes than single-plant operators perhaps because the former seem to be more frequently plagued by management problems and these are exacerbated by demand decline. In addition, it may be that single-plant operators are less sensitive to aggregate demand changes because the plant is their only means of livelihood and so they are more dedicated to keeping it open.

Extent of unionization. In every configuration of regression model, the presence or extent of unionization was not a significant variable in explaining the probability of closure, even for out-of-state, publicly-held firms. However, as we have seen, union presence does seem to be a factor for certain firms--those with a disposition to be geographically mobile and facing structural trends that stimulate movement to lower-wage, non-union sites, and those with a history of union conflict.

Six unionized plants (counting the asphalt shingle plant) had their operations moved to the South or to Mexico for reasons associated with labor issues. Two firm closures and two plant closures came about during or soon after long and bitter struggles with unions (2 Machinists, 1 Steelworkers at a textile plant, 1 United Rubber Workers). In at least three cases, there were clear management problems.⁴⁰ Unnecessary confrontation on the part of a union may have occurred, but such a determination is beyond the research scope of this study.

Plant/firm industry difference. The difference between plant and firm industry focus was not a significant variable in the regression models. Yet clearly, differences in product played a large role among closures. This contradiction might be explained at least in part by my decision rule to code as "same industry" plants with primary products related to, but not the same as, firm primary products. The fact is that a number of firms that I had coded "same industry" were closed because their product lines were not close enough to the parent firms' main concern. However, without much more detailed information on each firm product structure and the nature of their markets, information difficult or expensive to obtain, I think it would have been difficult to develop a coding scheme significantly more accurate.

Publicly traded. The publicly-traded variable was not significant in any model except that for the textile industry, in which two plant closures were relocations by publicly-held firms for reasons of factor costs (labor, lease). As with unionization or headquarters, this result does not mean that the factor had no influence. It only means that, all other factors held constant, publicly-held firms did not close plants more frequently than privately-held ones. While it is fairly easy to gather evidence indicating that a plant was closed because it was unionized, it is more difficult to obtain evidence that a corporation's concern for short-term profits to please the stock market resulted in a closure.

Synthesizing the Results of the Logit and Descriptive Analyses by Type of Firm

The results of the regressions and descriptive analyses are both rich and complex. At the risk of simplification, it seems to me that the influence of various organizational characteristics on the probability of closure is most clearly perceived when plants are disaggregated into four categories of firms: single-plant owners; single-plant firms of multi-firm owners; small, RI-headquartered multi-plant firms; and large, non-RI headquartered, multi-plant firms. I have prepared a chart that describes, by type of firm, the influence of various characteristics on the probability of plant closure (Table 4.10). The chart includes dynamics that were visible in the analyses, as well as a few speculations previously mentioned, e.g., that owners of several small plants might get overextended.

This disaggregation by type of firm seems to work because a large number of the influences on the probability of closure appear directly related to the headquarters location, firm size, and the complexity of the plant's corporate family. Within each category, variation in certain organizational characteristics can also strongly affect the probability of plant closure, e.g., the size of a plant in a multi-plant firm or the experience of management.

For simplicity's sake, the chart does not directly cover large in-state firms and small, multi-plant, out-of-state ones. The former appear to act in the same way as small in-state firms, except they are much less apt to fail. Conversely, small out-of-state firms (primarily Massachusetts-based) appear to act in the same way as large ones. In theory, one would think that the small non-local firms would be more apt to fail than the large ones. However, none did in the time period of study. It may be that there were only a handful of small out-of-state firms with plants in Rhode Island to begin with.

Table 4.10

RELATIONSHIPS BETWEEN TYPE OF FIRM AND PROBABILITY OF PLANT CLOSURE

	RI-HQ			NonRI-HQ
	Single-Plant Owner	Multi-Firm Owner Single-Plant Firm	Multi-Plant Firm (small)	Multi-Plant Firm (large)
General Probability of Closure	lower	higher	higher	higher
Types of Closure	firm failure	firm failure	firm failure product term. capacity reduc.	product term. capacity reduc. relocation
Characteristics which inherently lower probability of closure	dedicated mgt.		more professional management	more professional management
	geographically stable	geographically stable	geographically stable	
	open in partial capacity reductions	open in partial capacity reductions		
Characteristics which inherently increase probability of closure	low economies of scale in firm & plant	low economies of scale in firm & plant	lower economies of scale in firm & plant	firm economies of scale in production, finance, mgt.
		sensitive to reduction in aggregate demand		
			close in capacity reduction	close in capacity reduction
		overextended mgt. (?)		relocate capacity to lower factor costs
Potential Characteristics which will increase probability of closure	inexperienced in mgt., industry, product	inexperienced in mgt., industry, product	inexperience in mgt., industry, product	inexperience with product
			small plants	small plants

The Influences of State, Time Period and Population on Results

It seems to me that the typology of plant closures and the basic patterns of influence of the organizational variables on the probability of closure are generalizable to other areas and to the upward side of the business cycle. The dynamics seem so fundamental that they would likely appear in these other situations. However, the specific findings of similar studies carried out for other places and times probably would differ from the ones generated here in a number of ways.

First of all, the overall frequency of plant closures would differ with other industrial structures and points in time. Second, the distribution of closures and job loss within the plant closing typology would differ. The dominance of firm failure as a reason for plant closures seems very much a function of the small-firm structure of the Rhode Island jewelry industry and the occurrence of recessions.

Third, differences in industrial structure and business cycle would affect the size of estimated variable coefficients in the logit analysis. For instance, the strength of the relationship between acquisition and closure was in part due to the instability and small-firm structure of the jewelry industry. Differences in industry structure also could affect the shape of a probability curve. I noted earlier that a similar study of Ohio in the same period might have a positive relationship between plant size and probability of closure. However, I think that such a finding would reflect a momentary linear relationship between plant size and negative industry trends, and would not indicate an influence on the probability of closure that was a function of size per se.

Fourth, in other places and times, certain variables that were statistically significant in this analysis may not appear to be so. During the up side of a business cycle, logit regression analysis might provide less robust results simply because there would be a smaller percentage of closures in the data base. Again, though, I think that the basic patterns and reasons for plant closures identified here would still exist, their

presence would just more difficult to prove statistically. There also could be instances in which a variable not statistically significant in this study would become so. In the hypothetical Ohio study, the presence of unions might become statistically significant.

The unique dynamics of multi-firm owners of single-plant firms were not something I had expected to find. I wonder about the extent to which my findings for this group are a function of the unique nature of the Rhode Island economy, based as it is on small firms. In some states, particularly those with a branch plant orientation, there may be too few of this type of owner for the category to have influence in the regression model. For other states with numerous small firms, it would be interesting to see if the basic thrust of the Rhode Island results are replicated.

Regarding plants with less than 50 workers in multi-plant firms, I see no obvious reason why the basic findings here would not be applicable, particularly the one that suggests that smaller plants are more vulnerable. Extrapolation of the findings on single-plant firms to such firms under 50 is less clear. The probability curve for plant size suggested that smaller firms were less vulnerable to closure as size fell below 175. However, as I mentioned earlier, I believe that most single-plant firm failures occur to young firms before they ever reach 50 employees. Only a direct study could ascertain the probability of small single-firm plant closures and the factors that contribute to the phenomenon.

Plant Closings and the Interplay of Macroeconomic, Structural and Institutional Effects

In Chapter 1, I suggested that the magnitude of U.S. manufacturing job loss in recent years seems to reflect a large-scale restructuring of the nation's industrial base. I then described a number of macroeconomic, structural and institutional factors that have been put forth by observers as reasons for this job loss. The results of the gross flows analysis in Chapter 3 indicated that plant closings were an important, but not the primary, source of gross job loss in Rhode Island in the 1978-83 period. In this chap-

ter, as a means of gaining a better understanding of the role of various factors in plant closing job loss, I examined the relationships between plant closings and organizational characteristics.

Earlier in the chapter, I asserted that firm failures were the result of institutional responses to structural and macroeconomic opportunities and constraints, or, to put it another way, the result of internal responses to the environment. I suggested that a tension existed between institutional, structural and macroeconomic factors and that the tension varied from firm to firm, industry to industry, and one part of the business cycle to another. As I argue below, this perspective is relevant for all four types of plant closings--product terminations, capacity reductions and factor cost relocations, as well as firm failures.

Firms respond to structural and macroeconomic opportunities and constraints through making decisions regarding the flow of investment dollars into product, site, the various factors of production, and various overhead functions. As environmental conditions always change, firms must continually reassess and redirect the flow of funds. Investment decisions for manufacturing firms are of two types--categorical and incremental. Categorical decisions are those with a "lumpy," either/or quality and concern what products to manufacture and where to manufacture them. These decisions determine the production framework within incremental investment decisions are made: how much to invest in the production of a particular product and how to distribute that investment among the factors of production (production workers, management, overhead staff, plant and equipment, materials, etc.) and operating sites.⁴¹

Once made, categorical investment decisions, given that they take much time and money to implement and determine the production framework for the firm, usually are neither easily nor quickly reversed. A plant closing is a reversal of a categorical investment decision that results in ending investment at a particular site, and perhaps in a particular product. I suggest that each plant closing can be attributed primarily to

one of two types of institutional response to structural and macroeconomic conditions. Some plant closures are primarily the unintended results of management error, i.e. improper responses in light of environmental conditions. Errors may have been made in any of the variety of categorical and incremental investment decisions described in the previous paragraph, or in the implementation of investment decisions (e.g. a poorly designed marketing program). The types of investment errors visible in this chapter's descriptive analysis include overexpansion, making an ill-fitting product acquisition, and acquiring a firm without the proper skills to run it. In terms of plant closure categories, the effects of management error resulted in firm closures, product terminations and capacity reduction categories.

The second type of institutional response that results in plant closings is the intentional decision to close in light of macroeconomic and structural conditions. Of course, the decision to close may have been a wrong one. The key point is that the closure was perceived by decision-makers as the proper response in light of environmental conditions. Some closures in the second group are the result of a decision to reduce capacity in the face of large drops in aggregate demand. Others reflect an institutional determination to redeploy plant investment to other places and products, e.g., the termination of long-held products for replacement by more profitable ones, and the relocation of plant operations to reduce factor cost. In Rhode Island, it seems that most closures in the "intentional" group were in response to a change in the environment. However, in a few cases, a closure was in response to an internal change--e.g., an acquisition of a new subsidiary and consolidation of plant operations with headquarters.

Of course not every closure can be attributed to solely to internal error or to appropriate internal response to external conditions. Probably, a number of closures were the result of a combination of management error (e.g., entering a new market without fully understanding it) and change in environmental conditions (e.g., unexpectedly

rising dollar makes the new product vulnerable to imports). But the distinction is useful for the purposes of discussion.

This chapter's analyses indicate that not only can a plant closing be primarily attributed to one of two types of institutional responses to environmental conditions, but that the institutional response that results in a plant closing is very often a function of firm and plant organizational characteristics. Every organizational characteristic with explanatory power regarding plant closings appears to have a connection with either one or both of the institutional response types. Some organizational characteristics reflect a firm's ability to appropriately perceive and respond to environmental conditions, i.e. to avoid management error. These characteristics include firm age, years since acquisition and firm size.

Other organizational characteristics guide a firm in its perceptions of viable options as it determines whether or not to continue operating a particular plant. It seems that location of firm headquarters and firm size are important determinants regarding whether or not a firm will seriously consider relocating a plant's operations. Firm size also can be an indication of whether or not a firm has the internal resources to respond to new environmental conditions. For instance, in an industry in which large-scale investment in new mass production equipment is necessary to keep up, a small firm may decide to liquidate because it does not have the resources (or will) to make such an investment. The relationship of a plant's product to the primary focus of the firm can guide the decision to close in a number of instances. The presence of a union can encourage relocation. The fact that a firm is multi-plant will guide decision-makers to see any individual plant as less "lumpy" and so more subject to closure than would the owner of a single-plant firm. And I conjectured that in multi-plant firms, smaller plants are more likely to close than larger plants for logistical reasons.

In sum, organizational characteristics represent the "lens" through which management looks at its environment. Certain characteristics reflect management's ability to perceive environmental trends and make the right investment choices. Others guide management in its perception of alternatives to investment in a particular plant it is willing and able to consider. The nature of these influences need to be taken into account in the design of policies intended to counter plant closings, a topic that will be discussed in Chapter 7. In the next chapter, I look at the extent to which organizational variables appear related to percentage employment change at the plant level.

Having explored dynamics on the institutional side of the lens up to this point, I want summarize patterns on the environmental side that affect plant closings. Structural and macroeconomic opportunities and constraints strongly influence the range of investment choices which a firm perceives before it and the margin for management error before a plant closing occurs. Environmental conditions can be split into a demand side and a supply side. Trends that affect product demand, i.e. GNP growth, saving habits, exchange rates, changes in taste, and the introduction of substitute products, influence the frequency of firm failures, product terminations and capacity reductions. When demand is declining, the margin for management error in avoiding unintended plant closings narrows. Trends in demand also determine the frequency with which firms make intentional closures as the result of decisions to leave or reduce capacity in an industry.

Supply-side trends include those concerning industry concentration, the key element of competition (e.g., price, quality), production process technology, and the cost, location, and availability of labor and materials. Such trends influence both the determination about whether or not to continue investment at a particular site and the margin for management error before an unintended plant closure occurs.

In Chapter 1, I described the structuralist approach to explaining manufacturing job loss as one which emphasized the role of periodic spatial, technological and corpo-

rate reorganizations. For three reasons, such supply-side structural dynamics were not particularly visible in this analysis. First, given that I was examining a population of plants in which nearly two hundred 4-digit industries were represented, a structural analysis of each plant's industry was not feasible. Second, in the logit analysis, all structural and macroeconomic effects were represented by one variable, percentage U.S. employment change in plant's industry. That this variable was statistically significant for the population indicates that the environment indeed has an effect. However, the nature of the variable does not allow us to see the extent to which a plant's industry was being reorganized in spatial, technological and corporate terms.

Third, and very importantly, the state's largest industries simply were not undergoing highly visible restructuring. In-depth analyses of each of Rhode Island's major manufacturing industries by the Rhode Island Strategic Development Commission turned up only one 4-digit industry in which major spatial restructuring was occurring--wiring devices (the General Electric plants). Though the Commission did not analyze the apparel industry for reasons of confidentiality (because Health-Tex is so dominant), I also turned up anecdotal evidence of a movement in off-shore sites for women's apparel job shops. We also saw two plant operations, in surgical gloves and narrow fabrics, move South for labor-related reasons that fit in well with "profit cycle" theory. But overall, we saw only a handful of plant closures which could be reasonably explained by this theory.

The ability of "profit cycle" theory to explain plant closing dynamics varies with time and place, for two reasons. First, major restructurings are episodic--they do not go on all the time. Second, structuralist theory emphasizes the dynamics of industries with oligopolistic tendencies, those with product demand large, stable and certain enough to make large-scale investment and the corporate concentration of capital worthwhile. The dynamics of the jewelry industry, with its unstandardized produc-

ts and ever-changing fashions, is not neatly explained by an oligopoly-oriented paradigm.

In summation, my argument regarding the dynamics that bring about plant closings has four parts:

- o Plant closings are the results of institutional responses to macroeconomic and structural opportunities and constraints.
- o The institutional responses that result in plant closings are of two types: (1) management error which results in an unintended closure and (2) an intentional act of closing a plant which is perceived to be appropriate in light of external conditions.
- o Institutional responses that result in plant closings appear to be very much a function of organizational characteristics. Certain characteristics reflect firms' abilities to appropriately perceive and respond to environmental conditions, and so appear related to the extent to which management error results in closings. Other organizational characteristics guide firms' in their perceptions of viable investment options, and so seem related to the extent to which closings occur out of intent.
- o Structural and macroeconomic opportunities and constraints strongly influence the range of investment choices which a firm perceives before it and the margin for management error before an unintended plant closing occurs.

CHAPTER NOTES

¹See Roger Schmenner, op.cit.; Phillip Shapira, "Industry and Jobs in Transition: A Study of Industrial Restructuring and Worker Displacement," Ph.D. dissertation, University of California at Berkeley, November 1986; U.S. General Accounting Office, op.cit.

²For example, Doreen Massey and Richard Meegan, The Anatomy of Job Loss, New York: Methuen Press.

³For example, P.N. O'Farrell and R. Crouchley, "Industrial Closures in Ireland 1973-81: Analysis and Implication," Regional Studies, 17, 6; and Richard McGranahan, "Absentee and Local Ownership in Northwestern Wisconsin," Growth and Change, v.13, n. 2.

⁴Marie Howland has just published a study of the effect of local economic conditions on rates of plant closures. She sought to determine if inter-SMSA differences in the price of inputs, rates of unionization, changes in factor prices, and shifts in market demand affected the rates of plant closure. She found that, overall, local economic conditions have little to do with plant closure rates. However, she relies on the DMI file to provide these rates. As she gets plant closure rate of 28% over 7 years, it appears she did not correct for spurious closures. "Plant Closures and Local Economic Conditions," Institute for Urban Studies, University of Maryland, February 20, 1987.

⁵As mentioned in Chapter 1, I had hoped to carry out a separate analysis of the effect of operating characteristics on employment change, using the Census Bureau's Longitudinal Establishment Data file, but this analysis was not feasible because of spurious closures in the LED.

⁶U.S. Small Business Administration, The State of Small Business: A Report of the President (Washington, DC: U.S. Government Printing Office, March 1983), p. 238.

⁷Ibid., p. 157.

⁸The data base covers 583 establishments. However, one establishment operated solely as a corporate headquarters during the period. As the analysis was aimed at understanding the characteristics involved in the closure of production facilities, this establishment was excluded from the logit analysis.

⁹Rhode Island Strategic Development Commission, op.cit., p. 120.

¹⁰The particular wording of the survey depended on whether or not the firm being called was a subsidiary or an independent, was in business or out of business as of December 1983, and whether or not any of its plants had closed. To avoid having to use an enormously complex survey form, five variations were created. The interviewer used the one that fit the profile of the firm being called. For companies with more than one plant in Rhode Island, the portion of the survey that concerned plant-specific information (union, product) was repeated for each RI plant.

¹¹Almost all of the firms which agreed to answer the survey supplied answers to

all relevant questions, though completing the survey sometimes involved talking to more than one person. The question to which respondents were most sensitive concerned whether or not a plant was unionized. Regarding the latter question, several respondents inquired if the interviewer was scouting for a union. I anticipated this sensitivity and placed the union question last in the survey. In the handful of cases in which a respondent did not want to answer the union question, the state AFL-CIO office was able to supply an answer. In the end, 97% of the surveys with respondents had answers for every question.

One initial fear I had was that it would be difficult to get information on the closed plants. However, using respondents and the files I created for the Greenhouse plant closing study, we fully completed surveys for 93% of the closed plants. Firms that operated about half the closed plants were still in existence and were not reluctant to give information. For single-plant firms that had gone bankrupt, many former owners were quite open to answering questions. In cases in which the owner of a closed firm could not be contacted, interviewers attempted to reach former workers, union officials, or owners of competing firms.

For reasons both inside and outside of my control, several issues arose concerning data accuracy and consistency. First, I had no means to check the accuracy of respondents' knowledge. However, follow-up telephone calls were made to eliminate any inconsistencies in respondents' answers.

Second, the survey question regarding the percentage of the workforce covered by collective bargaining did not specify if the denominator was to be the total establishment workforce or the production workforce. Consequently, the answers received are not entirely consistent with each other. As the single most common answer for unionized plants was 100%, my sense is that most respondents used the production workforce as the denominator. It also should be kept in mind that all percentages were spontaneous estimates by the respondents.

For 81% of the unionized plants, covered workers comprised either over 79% or under 21% of the workforce. This bimodal tendency seems to indicate that the wording probably did not have much effect. The same bimodal tendency probably would have appeared in any case.

The third data issue concerns acquisitions. Respondents were asked two acquisition questions: (1) whether or not, and when, the firm had been acquired and (2) whether or not the plant itself had been acquired by another firm since 1970, and when. The first question was aimed at firms that changed ownership but remained intact as an independent, viable entities. Only one firm is involved--it just changes hands. However, there is another type of acquisition, in which one firm acquires only a part of another. Suppose ABC Corporation sells its RI plant to XYZ Corporation. ABC itself remains intact as a firm. The survey would first ask if XYZ Corporation had ever been acquired. However, the answer would not indicate if the old ABC plant was acquired by XYZ Corporation. The plant acquisition question was intended to capture this type of information.

The plant acquisition question had two design problems. First, I decided to ask if the plant had been acquired only since 1970. Thus the question about plant acquisition was not parallel to firm acquisition question, which put no time constraints on when the acquisition took place. I do not believe this problem had much of an impact. If a pre-1970 plant acquisition was the last acquisition made of the respondent's plant, the respondent usually told the interviewer anyway. When I made my final coding

scheme, I made sure that every plant acquisitions, regardless of date, was incorporated into the data base if it was the last acquisition of the plant to take place.

Second, the original wording of the plant acquisition question was vague, with the result that one-fourth of the way through the survey no respondent answered "yes" to the question. At that point, the wording was corrected. As a consequence, however, plant acquisitions since 1970 (which only amounted to 6 for the 75% of the completed surveys which had proper wording) may be underreported to a slight degree.

¹²In some cases, the acquired plant or firm was not transformed into a formal division or subsidiary. However, if the acquired entity operated independently within the acquiring firm because it had a distinctly different product or market, I treated it as if it were a subsidiary.

¹³To be sure, I tried substituting 1978 employment for peak employment in the logit regressions. Peak employment always came out the stronger explanatory variable.

¹⁴I was not able to obtain information of ownership of other companies for the owners of 94 single-plant firms. On the other hand, information is missing for only 3 plants for the multi-plant firm variable. As cases with missing data for particular variables cannot be used to build regression models using those variables, the models using the multi-plant firm variable tend to utilize data from a larger number of plants than do models using the multi-plant owner variable.

¹⁵A partial chi-squared was obtained by subtracting the chi-squared for the more restricted model (x variables) from that for the less restricted model (x+y variables). The probability of a partial chi-squared being greater than the observed partial chi-squared if the null hypothesis were true was then determined for y degrees of freedom.

Because not every plant had a complete data set, the more variables I had in a model the smaller N (number of cases) became. However, to correctly perform the partial chi-squared test I needed the same plant sample in both models. Therefore, for the purposes of the partial chi-squared test, I removed plants from the more restricted model that were not included in the less restricted model.

¹⁶The formula to convert the logit regression results to a probability equation is:
$$1/(1 + \exp(-\text{constant} - \text{beta1}*\text{parameter1} - \text{beta2}*\text{parameter2} - \dots))$$

¹⁷The regression curves were determined by inserting the mean value for each of the independent variables to be held constant. They are not meant to be exact, but to show general tendencies.

¹⁸The means and standard deviations of the two samples are quite similar, so lack of variance in the smaller sample should not be a problem.

¹⁹I have definite firm closure information for 75 of the 76 plants. The one plant with missing information closed down in 1983. The out-of-state parent is no longer in existence, but I could not discover if it and the plant shut down simultaneously.

²⁰The U.S. Bureau of the Census' Longitudinal Establishment Data file (LED) can provide total manufacturing employment data by ultimate parent. One of the losses in being unable to use the LED for logit analysis was being unable to directly see

the effects of firm size on the probability of closure.

²¹I did not use the acquisition interaction variable in this model because I did not have "years since succession" data for firms taken over by relatives.

²²For reasons of confidentiality, I cannot reveal the names of the sources.

²³Two cases were in the classic conglomerate mold. Colgate-Palmolive was the parent for Bancroft Sporting Goods. Colgate management was unable to keep up with innovations in the industry. When the tennis boom ended, they sold Bancroft. Liggett and Meyers, of cigarette fame, bought and sold a watch band company. A third conglomerate was privately-held, with a scientific orientation--my interviewee told me that the conglomerate drained profits from the Rhode Island plant to invest in its other holdings.

²⁴One of the revealing aspects of this study was the contradictions between the reasons some owners gave reporters for closure, and the reasons provided by my interviewees. In no news article did an owner ever blame himself, which is understandable--imports, regulation, and energy costs were issues often mentioned.

²⁵cf. Bluestone and Harrison, op.cit.

²⁶I could not include percentage national employment change in the firm closure regression because I had SIC code by plant not firm.

²⁷For the local consolidations, at least 80% of the workers in the closed plants lost their jobs.

²⁸U.S. Department of Commerce, 1987 U.S. Industrial Outlook. The Providence Journal reported that after Hillenbrand's acquisition there were some morale problems and several managers left the company, in spite of the parent's attempts to be sensitive to local management needs. (Leonard Edgerly, "Hillenbrand is investing for the future," Providence Journal, December 28, 1980.) However, a union representative suggests that the better managers stayed on and that Hillenbrand's significant infusion of investment has been very important.

²⁹Hamilton Allen, "Northern Telecom to close in April; 290 employees affected," Providence Journal, January 15, 1983.

³⁰David Edgerly, "Strikers' pay may scare off 2 large firms," Providence Journal, December 21, 1976.

³¹"Is enigmatic owner of 'Gansett brewery testing Ocean State in push for breaks?" Providence Journal, August 16, 1981.

³²The bankruptcy occurred after the owner of the company stopped taking interest in the business and let his lawyer run it. Apparently, the plant was in bad repair and relations with the union local not entirely smooth.

³³"NLRB judge upholds firm on TFE firings," Providence Journal, May 13, 1977.

³⁴The company president added, "If you interpret that as meaning we will have lower wages, you're dead wrong." Leonard S. Edgerly, "TFE to phase out Warwick facility," Providence Journal, June 24, 1980.

³⁵As the reason for relocation usually came from the company respondent and/or a company official quoted in an article, there is the possibility that labor was in fact an issue but was not mentioned. However, I attempted to structure the survey question in a way that encouraged truth telling. The respondent was asked what the advantages of the new location were over the old, and provided a checklist of eight possibilities. The respondent could choose more than one. The respondent was then asked which was the most important. Each respondent that did not have labor costs as the main issue did not mention it in the checklist either.

³⁶Birch, op.cit. (summary version), p. 4.

³⁷Ibid. (full report), p. 25.

³⁸Ibid., p.15.

³⁹Even this study's figures underestimate the nature of the relocation problem. In the previous section, we saw that four plants closed for capacity reduction reasons and operations were consolidated outside of Rhode Island. Whatever jobs were added to the receiving plants after the capacity reduction also represents relocated jobs.

⁴⁰The fourth is the Davol latex plant, which unionized soon after the company was acquired by International Paper Co. It is possible that the union-management problems stemmed from actions by new management. I had no information on this case.

⁴¹I am using the term "investment" here in the broad sense, any commitment of corporate funds. The typology oversimplifies matters somewhat. For instance, a decision to undertake a major overhaul of production processes, as auto companies have recently done, has the look of a categorical decision. My thinking about a typology of investment decisions was stimulated by Richard Walker and John Storper, op. cit.

Table 4A.1

PLANT CLOSURES BY INDUSTRY GROUP
Rhode Island Plants with 50+ Employees during 1977-83

Industry Group	All Plants		Plants in Single- Plant Firms		Plants in Multi- Plant Firms	
	C/N	%	C/N	%	C/N	%
Food	3/22	13.6%	1/11	9.1%	2/11	18.2%
Textiles	12/83	14.5	4/47	8.5	8/35	22.9
Apparel	5/18	27.8	4/12	33.3	1/6	16.7
Lumber, furniture, paper	2/22	9.1	0/12	0.0	2/10	20.0
Printing, publishing	2/18	11.1	1/12	8.3	1/6	16.7
Chemicals	1/11	9.1	0/4	0.0	1/7	14.3
Plastics	2/24	8.3	1/14	7.1	1/10	10.0
Leather	4/11	36.6	0/3	0.0	4/8	50.0
Stone, clay, glass	3/10	30.0	0/4	0.0	3/6	50.0
Primary metals	5/29	17.2	2/12	16.7	3/17	17.7
Fabricated metals	1/30	3.3	0/19	0.0	1/11	9.1
Machinery	4/26	15.4	0/8	0.0	4/17	23.5
Electronics	3/40	7.5	0/15	0.0	3/25	12.0
Trans. equip.	1/10	5.6	1/11	9.1	0/7	0.0
Instruments	2/29	6.9	1/9	11.1	1/20	5.0
Jewelry	20/151	13.3	13/120	10.8	7/30	23.3
Misc.	6/40	15.0	4/24	16.7	2/16	12.5
Total	76/582	13.1%	32/337	9.5%	44/242	18.2%

Note: Firm characteristics could not be obtained for a small number of plants. Therefore, the addition of figures in columns 2 and 3 may not add to the figure in column 1.

Table 4A.2

FREQUENCY OF PLANT CLOSURE BY PEAK PLANT SIZE

Peak plant size	Closed	Total	Closure Rate
50-99	31	236	13.1%
100-249	30	211	14.2
250-499	13	83	15.7
500-999	2	38	5.3
1000+	0	14	0.0
Total	76	582	13.1%

Table 4A.3

FREQUENCY OF PLANT CLOSURE BY AGE OF FIRM

Firm age	Closed	Total	Closure Rate
0-5	6	11	54.5%
6-10	3	27	11.1
11-20	7	70	10.0
21-40	21	159	13.2
41+	36	228	15.8
Total	73	495	14.8%

Table 4A.4

FREQUENCY OF PLANT CLOSURE BY PERCENTAGE 1978-83 CHANGE
IN U.S. EMPLOYMENT IN PLANT'S INDUSTRY

Pct. Change	Closed	Total	Closure Rate
<=-30%	16	102	15.7%
-30% to -15%	26	185	14.1
-15% to 0%	26	203	12.8
>=0%	8	92	8.7
Total	76	582	13.1%

Table 4A.5

FREQUENCY OF PLANT CLOSURE BY PERCENTAGE OF WORKFORCE
COVERED BY COLLECTIVE BARGAINING

Pct. Covered	Closed	Total	Closure Rate
0-19%	50	415	12.1%
20-79%	1	34	2.9
80-100%	25	123	20.3
Unknown	0	3	
Total	76	575	13.2%

Table 4A.6

FREQUENCY OF PLANT CLOSURE BY ACQUISITION AND YEARS
SINCE ACQUISITION

Acquisition	Closed	Total	Closure Rate
No	34	294	11.7%
Yes	39	200	19.5
Total	73	494	14.8

Years Since Acquisition

1-5	23	81	28.4%
6-10	6	41	14.6
11-20	5	50	10.0
20-40	1	17	5.9
41+	4	9	44.4
Unknown	0	2	

Table 4A.7

REGRESSION MODELS FOR PROBABILITY OF PLANT CLOSURE
Global Models

	ALL PLANTS		PLANTS IN SINGLE-PLANT FIRMS		PLANTS IN MULTI-PLANT FIRMS		SINGLE-PLANT OWNERS		PLANTS HELD BY MULTI-PLANT OWNERS	
Cases										
N	471		245		197		196		249	
Closed	70		22		42		14		50	
Parameter	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
CONSTANT	-3.387	-7.77	-7.464	-4.60	-2.561	-4.23	-5.582	-2.89	-3.468	-5.21
MULT1	0.920	2.50	---	---	---	---	---	---	0.524	0.98
MULT2	---	---	1.052	1.98	---	---	---	---	---	---
FIRMAE	0.010	2.09	0.017	1.95	0.014	2.24	-0.001	-0.09	0.018	3.06
AGEINV	9.952	3.69	10.214	2.30	12.801	2.99	-1.673	-0.15	14.150	3.68
ACQINV	2.671	3.70	1.845	1.17	2.789	3.20	1.181	0.59	2.894	3.42
ICH7883	-0.021	-2.18	-0.041	-2.13	-0.010	-0.86	-0.022	-1.10	-0.023	-1.96
PEAKSIZE	-0.002	-2.17	0.040	1.91	-0.002	-1.89	0.037	1.62	-0.002	-2.10
SIZESQ	---	---	-0.0001	-1.71	---	---	-0.0001	-1.43	---	---
PCTUNION	0.004	1.14	0.009	1.38	0.002	0.35	0.010	1.44	0.0002	0.06
PUBLIC	0.098	0.18	---	---	0.080	0.15	---	---	0.319	0.62
NONR1	-0.414	-0.87	---	---	-0.555	-1.08	---	---	-0.502	-1.01
PFD1	0.288	0.56	---	---	0.405	0.76	---	---	---	---
Chi-squared										
global	54.4		26.0		30.7		8.4		44.0	
restricted	52.6		23.2		27.7		5.0		42.7	

CHAPTER 5

THE RELATIONSHIP BETWEEN PLANT EMPLOYMENT CHANGE AND PLANT CHARACTERISTICS

Introduction

The gross flows analysis resulted in a description of the components of manufacturing employment change in terms of job loss due to plant closings and contractions, and job gains due to plant expansions. The last chapter allowed us to develop a deeper understanding of the reasons for one component of employment change, plant closings, by examining the strong and complex influences of organizational characteristics on the frequency of closure. In this chapter, I look at the influence of organizational characteristics on expansions and contractions, i.e. the plants that did not close by 1983.

I undertake this analysis through building ordinary least squares (OLS) regression models, using percentage change in plant employment between 1978 and 1983 as the dependent variable. The plant population is all plants which had 50 or more employees in 1978 and were open in 1983. As in Chapter 3, I choose the 1978-83 period because the end points bracket a period of manufacturing employment decline. The subject group excludes plants under 50 in 1978 because the data base contains only growing plants from that group--their inclusion would have biased the analysis in favor of expanding plants. I use percentage, rather than actual, employment change as the dependent variable because the former controls for initial plant size while the latter does not.

Percentage employment change for the population of plants with 50+ employees in 1978 is represented by the stem-and-leaf plot in Figure 5.1. To give a sense of the relationship between plant closures, contractions and expansions, I plotted percentage change for all plants. The plot is a visual representation of the plant investment typol-

STEM AND LEAF PLOT
PERCENTAGE CHANGE IN PLANT EMPLOYMENT, 1978-83

Plot is of all plants

155

ogy discussed in the last chapter. Plant closings, as reversals of categorical investment decisions, are phenomena quite distinct from employment change in open plants. For the open plants, the plot is bell-shaped, as one might expect. The plot is extended on the expansion side simply because employment can rise more than 100%, but cannot fall below -100%.

I utilized the same type of hierarchical modelling process as in the last chapter, using partial F-tests at a .05 level of significance to determine whether or not to include new variables to the model. In the process of building the models, I removed a number of plants that were outliers in terms of percentage growth or size.¹

Regression Analyses

The restricted and global models for open plants are presented in Table 5.1. The restricted model r-squared is minuscule--2.8%. Only two variables are significant--percentage change in industry employment and base year plant employment. The first variable one would expect to see, and the relationship with plant employment change appears very direct--each 1% change at the national level is likely to produce a .32% change in plant employment. The coefficient for initial plant size is negative and very small. All other factors being held constant, a 300-person plant is likely to have employment change 3 percentage points lower than a 100-person plant.

For the purposes of comparison, I also developed an OLS regression model for all plants. The results indicate that the presence of plant closings, with their extreme (100%) percentage decline in employment, heavily influences the model. Because the percentage plot is bimodal, representing both categorical and incremental results, this model is not particularly meaningful.

Table 5.1

REGRESSION MODELS FOR PERCENTAGE CHANGE
IN PLANT EMPLOYMENT, 1978-83

	ALL PLANTS				OPEN PLANTS			
	RESTRICTED		GLOBAL		RESTRICTED		GLOBAL	
Cases	406		399		418		333	
Adjusted R-sq.	.086		.081		.028		.025	
Parameter	Coeff.	t	Coeff.	t	Coeff.	t	Coeff.	t
CONSTANT	5.9	0.84	9.7	1.29	-0.9	-0.36	-9.1	-1.14
ICH7883	0.42	3.14	0.41	2.96	0.32	3.18	0.20	1.69
ACQINV	-65.4	-4.77	-58.6	-3.89	---	---	-2.4	-0.12
FIRMAGE	-0.2	-2.11	-0.2	-2.06	---	---	0.05	0.56
AGEINV	-235.6	-2.88	-235.6	-2.78	---	---	192.1	1.66
A78*	---	---	-0.005	-0.43	-0.015	-2.16	-0.022	-2.18
MULTI	---	---	-3.1	-0.49	---	---	8.5	1.54
KCNRI	---	---	-3.1	-0.39	---	---	-9.0	-1.28
PCTUNION	---	---	-0.03	-0.48	---	---	0.002	0.03
PUBLIC	---	---	7.5	0.82	---	---	7.3	0.93
PFDI	---	---	-8.1	-0.90	---	---	-8.7	-1.08

* 1978 plant employment

Analytic Conclusions

While organizational characteristics appear to have a strong relationship to the reversal of plant investment decisions, they can help little in explaining expansions and contractions in open plants. Moreover, the only significant variable with a sizable coefficient, percent industry employment change, reflects external conditions and tells us nothing about institutional factors that might influence the nature of decision-making.

For several reasons, I am doubtful that the slightly negative coefficient for plant size in the open plant model should be interpreted as meaning that small plants are more competitive than large ones. Regarding expanding plants, it logically is more likely that a 50-person plant will grow 40% than it is for a 500-person plant. For the latter, there is a higher risk due to the large size of the new investment and, if the decision is made to go ahead, the greater likelihood that such an investment would result in the building of a new plant rather than the expansion of an existing one.

Regarding plants with declining employment, we saw in the logit regression that in the face of a drop in demand, small plants belonging to multi-plant companies are more likely to close than are large plants. I had hypothesized that large plants would be more likely to cut back on employment than to close. Small plants in the open plants model would tend to look healthier because the ones that closed due to cutbacks are no longer in the sample.

In conclusion, expansions and contractions seem to be a function of factors other than fundamental organizational characteristics. There are many examples of such factors. For instance, in the face of declining demand, firms have different approaches to staffing changes. Companies with skilled workers might be more reluctant to resort to layoffs than would firms reliant on semi-skilled or unskilled workers. Productivity changes, whether through the introduction of new technology or line speedup, significantly vary, even among firms in the same industry. In addition, while national

industry employment change captures basic trends in industry employment, it does not accurately cover trends in a plant's basic product, which usually is but one small slice of the group of products that make up a 4-digit industry. Plants coded in the same industry have different product mixes (including many outside the coded industry), and so will grow or shrink differently in response to the same market conditions. And of course there are very basic differences in management and in the organization of work that will also result in different responses to similar conditions. In sum, percentage employment change in open plants is apparently a function of a number of subtle, complex and idiosyncratic factors that cannot be captured by simple organizational categories.

Given these dynamics, I would not expect the overall explanatory power of the regression model for contractions and expansions to be much different in any other economy. However, I would be surprised if national industry employment change did not have some explanatory power, however small, in any situation. I would think that, despite the fact that employment at the national level is measured for a 4-digit industry, the relationship to expansions and contractions always would be significant and positively correlated.

The absence of plants of less than 50 probably is irrelevant to the results. There is no reason to think that the power of organizational characteristics to explain expansions and contractions would be substantially higher for smaller plants.

CHAPTER NOTES

¹Specifically, I took out the five plants that had expanded more than 110% (the bottom skew to the bell curve) and the General Dynamics submarine plant. Each of the former started with less than 100 workers. The latter had an enormous influence in the model because it was twice as large as any other and grew 50%, while most other large plants declined.

I also removed 15 open plants for which (1) the owner in 1982 was different than the owner in 1978, (2) there was a significant 1978-83 employment shift (over 10%), and (3) the majority of 1978-83 employment shift occurred under the 1978 owner. As plant characteristics were collected only for the 1982 owner, if these plants were left in the sample, the employment change would have been attributed to characteristics of the wrong owner.

CHAPTER 6
**AN ASSESSMENT OF THE USEFULNESS OF
THE U.S. CENSUS BUREAU'S
LONGITUDINAL ESTABLISHMENT DATA FILE
FOR ANALYSIS OF PLANT CLOSURES**

Introduction

To complement the analysis of the relationship between organizational characteristics and employment change, I attempted to use the Longitudinal Establishment Data (LED) file to identify what effects, if any, relative differences in plant operating characteristics, particularly differences in wage levels, cost of materials, and labor productivity, had on employment change. The LED file brings together establishment data contained in the Censuses of Manufactures and the Annual Surveys of Manufactures conducted by the U.S. Bureau of the Census. For every year which ends in a "2" or a "7" (e.g., 1977, 1982), the Bureau of the Census undertakes a Census of Manufactures, which attempts to obtain and analyze operating information on every manufacturing establishment in the U.S. (about 225,000). Information collected includes employment, production hours, cost of materials, capital expenditures, value added and value of shipments by seven-digit product code. In the years between Censuses, the Census Bureau carries out an Annual Survey of Manufactures (ASM), which collects somewhat more detailed information from a sample of 56,000 manufacturing establishments.¹ The LED is maintained and operated by the Center for Economic Studies (CES), an arm of the Census Bureau which takes on contract work on confidential data for non-Census clients. The data in the LED are considered confidential and may not be released to the public in any form in which characteristics of individual establishments can be identified.

The thrust of the planned approach was straightforward, build regression models in which the dependent variables measure employment change and the inde-

pendent variables represent establishment characteristics. My intent was to perform a series of industry-specific analyses. It seemed inappropriate to throw jewelry plant characteristics and textile plant characteristics into the same model and expect any meaningful patterns regarding the effect of wage rates on employment change. The study was viewed by both myself and CES as an experiment--it had not been tried before.²

Unfortunately, the experiment was not able to produce meaningful statistical results. The major reason was that the LED is unable to connect the successive census records of a significant number of plants. Consequently, the number of plant "deaths" reported by the LED is nearly double the actual number (as determined by the DES/survey analysis). This fact makes meaningful statistical analysis impossible.

The purpose of this chapter is to describe the intended structure of the analysis and of the nature of the LED problems uncovered. While I could not obtain a useful analysis of the data, both I and the CES staff learned a significant amount about the nature of the LED data set.

The Design of the Analysis

I needed to make Three sets of choices with regard to the model--the scope of the population, the dependent variables and the independent variables.

--Population

The choice of the populations to study evolved from the following principles:

- o Because actual operating data was to be used, it was clear that each sample group would need to be industry-specific at the 4-digit level. A comparison of average wages for 4-digit industries classified within the same 3-digit industry group indicated that the 4-digit industry wages differed enough to make analysis at even the 3-digit level inappropriate.

- o The size of a sample group had to meet two criteria. First, I determined that there should be at least 40 establishments in the group, i.e. 10 cases for every independent variable, assuming no interaction terms. This choice allowed for a large enough sample so that standard errors could be minimized, yet also allowed for the possibility that several industries could be analyzed. Second, I wanted the industry to be of some economic importance in the economy--otherwise there was no rationale for studying it. I chose a minimum industry size of 1000 employees.
- o The nature of the LED indicated that only data for the Census years could be used, at least for a small area like Rhode Island. The Census years have 100% coverage of all establishments. The ASM only includes a sample of the establishments. For an area as small as Rhode Island, or even for New England, that sample would have been too small for meaningful analysis. So it was decided to analyze employment change over two intercensal periods--1972-77 and 1977-82.
- o For logit analysis, for which the dependent variable is categorical (plant open/plant closed), I wanted a closure rate of at least 10%, out of concern that otherwise there would be too little variation in the dependent variable for meaningful analysis.

On the basis of these criteria and using published Census data, I identified eleven industry groups as potential choices for analysis. It was clear that in order to reach 40 establishments per industry group it would be necessary for many industries to have a minimum plant size of 25, rather than 50 as in the DES/survey study, and expand the geographic boundaries of analysis from Rhode Island to the six New England states. I thought that for the purposes of understanding the effect of operating characteristics on employment change, rigid political boundaries did not need to be ad-

hered to. As long as establishments faced the same general locational factors, the geographic boundaries of the analysis could be expanded.

CES produced tables which provided establishments counts by size, area, births and deaths for both the 1972-77 and 1977-82 periods. On the basis of these tables, I selected ten establishment groups, covering five industries, for analysis. In all cases, the establishment group was to cover all plants with 25 or more employees in the base year. The establishment groups selected were:

For 1972-77--2241 (NE), 3471 (NE), 3911 (NE), and 3961 (RI)
For 1977-82--2241 (NE), 3471 (NE), 3911 (NE & RI), 3915 (NE), 3961 (RI)

SIC code: 2241--Narrow Fabric Mills, 3471--Metal Plating and Polishing, 3911--Precious Metal Jewelry, 3915--Jewelers' Materials and Lapidary Work, and 3961--Costume Jewelry.

Because membership in each group was a function of employee size in the base year, the 1972 base year groups were chosen entirely independently of the 1977 base year groups.

--Variables

Conceptual framework. As with the analysis of the influence of organizational characteristics, there was to be one logit model in the LED analysis, using "plant open" as the dependent categorical variable, and one OLS model, using change in establishment employment as the dependent continuous variable.

On the basis of the data collected through the Census, I deemed four operating characteristics both important and feasible to analyze--wage costs, material costs, labor productivity, and total value of shipments. There are a number of important data items which are collected by the ASM but not for the Census as a whole, e.g., capital expenditures, fringe benefits and energy costs. Because data for these characteristics are collected only for a handful of plants in each industry, it was not feasible to use them in this analysis.

Establishments in four-digit industries do not all produce the same type of product. The Census Bureau recognizes this by assigning a fifth-digit to each plant that symbolizes its "primary product." Because I thought that differences between primary products within an industry could be a factor in explaining changes in employment, I included one or more dummy variables to represent primary product codes (PPCs) in industries that had more than one PPC. In this study, two of the five industries had more than one PPC:

2241: 1--woven narrow fabrics, 4--braided narrow fabrics, and 5--covered rubber thread.

3915: 1--jewelers' findings and materials and 2--lapidary work and diamond cutting and polishing.

Two sets of independent variables were designed. The first was comprised of the base year characteristics of each establishment, e.g., wage level in the base year. These independent variables were to be evaluated as predictors of employment change. In the second set, the independent variables measured the change in each characteristic from the base year to the next census year. I wanted to see the extent to which employment change is associated with change in establishment characteristics. This second variable set could be employed only for plants that stayed open and in the same industry over the period. Consequently, only an OLS model could be built using it.

Base-year characteristics. For the base year model, CES was asked to produce a correlation matrix that included the following variables:³

Operating characteristics:

production worker wages/production hour
value added/production hour
production worker wages/value added
cost of materials/value added
total value of shipments

Organizational characteristics:

number of establishment employees
number of full-time equivalent establishment production workers (production hours/2000)
single-unit/multi-unit firm

number of employees in the firm's manufacturing establishments
number of FTE firm production workers
if the industry has more than one primary product code (PPC), a series of
dummy variables to reflect this.

The choice of wages/hr. and value added/hr. was straightforward--these represent measures of labor costs and labor productivity. For cases in which the sample size was low, these two variables were combined into one, wages/value added. The optimal measure of materials cost would be cost of materials per unit of production. However, while the Census Bureau does collect production quantity data in some cases, product units are not standardized across establishments so cost per unit measures would be meaningless. The second-best choice was cost of materials per dollar of value added. Total value of shipments was included to cover cases in which the plant basically performed assembly rather than manufacturing work, i.e. with low employee levels and high value of shipments.

The number of employees and fulltime-equivalent production workers in the establishment and the firm were meant to be substitutes for one another. I thought that one might have a better fit than the other in certain instances.

Change in operating characteristics. I wanted to build two different models using variables that measured change in operating characteristics over the period. The first model was to examine establishment employment change as a function of the change in certain other establishment characteristics. In the second model, the independent variables measured changes in each establishment relative to changes in the industry for the U.S. as a whole. The dependent and independent variables for both models are defined in the appendix.

The Problem of Spurious Plant Closures

The planned LED-based analyses were not feasible because the LED significantly overcounts the number of plant closures. Theoretically, all plant closures should be

able to be identified by what is known as a census coverage code. Census coverage codes are supposed to describe major changes in plant status, e.g., changes in ownership or company structure, acquisitions, plant closures and plant relocations. However, CES staff's experience with this code has told them that many plant closures are missed. Consequently, for the purposes of this study, CES identified plant closures through the disappearance of a plant from the LED between one census period and the next. A plant is identified by a permanent plant number (PPN). The disappearance of a PPN was considered a plant closure.

When a plant changes ownership, the plant is supposed to retain its PPN. CES staff had some worry that, because Census Bureau procedures for smaller plants are not as thorough as those for larger plants, a small plant ownership change might result in the termination of one PPN and the generation of a new one, and so look like a closure and a birth on the same site. As these worries could not be quantified, the decision was made to go ahead with the analysis.

However, once the DES/survey data base was completed, a comparison was made of the plant closure rates in the two data bases (LED and DES/survey) for the plants in the five industries that had 50 or more employees in 1977. The results indicate that the LED rate was more than twice as high as the DES/survey rate. According to the LED, 26% of the Rhode Island plants in the five industries that had 50 or more employees in 1977 were closed by 1982. In the DES/survey data base, the figure was 10% for 1977 plants with 50 or more employees. When the comparison is made for all 11 industries for which CES provided counts, the results are the same (Table 6.1).

Three factors support the accuracy of the comparison and indicate the presence of a large number of spurious closures in the LED. First, the establishment counts in both data bases are remarkably similar. The counts for jewelry and plastics are exactly the same. Those for textiles may differ because of differences in SIC classification. (There are a number of textile-related industries not covered in the comparison. On

Table 6.1

COMPARISON OF PLANT CLOSURE RATES
FOR SELECTED INDUSTRIES, 1978-81
DES/SURVEY DATA BASE AND CENSUS LED

Plants with 50 or more employees in 1977

<u>SIC</u>	<u>DES/Survey</u>			<u>Census LED</u>		
	<u># estab.</u>	<u># closed</u>	<u>% closed</u>	<u># estab.</u>	<u># closed</u>	<u>% closed</u>
Textiles:						
2221	5	1	20.0%	6	3	50.0%
2231	7	1	14.3	3	1	33.3
2241	25	4	16.0	22	6	27.2
226	15	1	6.6	11	2	18.2
228	8	0	0.0	7	3	42.9
2292	4	0	0.0	4	0	0.0
Total	64	9	14.1%	53	15	28.3%
Plastics:						
3079	21	2	9.5%	21	4	19.0%
Jewelry-related						
3471	12	2	16.7%	9	1	11.1%
3911	28	3	10.7	35	8	22.9
3915	18	0	0.0	18	4	22.2
3961	65	6	9.2	61	19	31.1
Total	123	11	10.2%	123	32	26.0
TOTAL	208	20	9.6%	197	51	25.9%

Note: DES/survey data base figures adjusted to include closures occurring in late 1977 and early 1978. DES/survey closure rate if end date extended to December 1982 is 13.0%.

the other hand, all jewelry industries are represented, so even though there are differences in the counts at the 4-digit level, the total jewelry counts are the same.) Hence, it can be assumed that each data base is dealing with the same plant population, more or less. Second, as the DES/survey data base was painstakingly prepared, plant by plant, and over 80% of the plants had completed surveys, I had great confidence in the overall accuracy of the count of plant closures. One obvious method of dealing with the problem of spurious closures was to compare the names and addresses of the plant closures from one data base with that of the other. Unfortunately, the LED does not carry names and addresses in its file, so such a comparison could not be made.

Third, a review of methodological differences between the two approaches to counting plant closures could not provide reasons for the much higher closure rate indicated by the LED. For instance, it is possible that the Census Bureau accurately determined that certain single-site firms had shifted from manufacturing to wholesale, but that the DES/survey data base did not pick up this shift. However, for several reasons, I do not think this can account for the difference in closure rates. One hundred twenty-one of the 147 plants (82%) in the five original industries answered the survey, so I know directly from the respondents whether or not they remained in manufacturing. In addition, I believe I have accurate information from other sources for the 26 non-respondents. When the DES data printouts were prepared, I asked that the SIC code be given for each plant for each observation month. DES updates its SIC code for every employer every three years (one-third each year) through the use of a survey which asks questions about the type of business and products. Assuming the surveys were accurately filled out, we were able to pick up most of the SIC code changes. Moreover, 24 of the 26 are in the 1986 Rhode Island Directory of Manufactures. The two that closed after 1983 have employment figures up to 1983 that are at a level which do not decline steeply in a way that suggests a shift from a manufacturing to a wholesale operation.

As a matter of fact, it seems that the DES/survey data base has a few plant closures not considered as such by the LED. According to the SIC system of industrial classification, firms that shift from production to jobbing (whereby they have actual production done on contract) are still classified as being manufacturers. Both the LED and DES adhere to this approach. However, for the DES/survey data base, I took a more constrained definition of manufacturing--if a firm eliminated its production process and became a jobber, the plant was considered closed. Two of the DES/survey plant closures in SIC 3961 fit this profile, but would not be considered closures by the LED.

Another potential reason for the difference in closure rates is that the LED might be counting as closures the relocation of plants to areas nearby enough that the same workforce could commute to the new site. For the DES/survey data base, closed establishments were not considered closed plant operations when they were relocated near enough to the old site that the same workforce could retain their jobs. However, the LED treats some local relocations somewhat differently. If a plant relocates across a county line, the Census Bureau gives it a new PPN, which makes such relocations look like closures and births. However, both a review of DES information (I received all address changes) and a comparison between each plant's 1977 address according to DES and its 1985 address in the manufacturers' directory indicated that there were no local relocations across county lines. So it seems that the overcount of plant deaths by the LED occurred for other reasons.

One factor that could explain some small difference between the two closure rates may be that the LED may actually pick up some 1982 closures in their count, even though any firm which operated during any portion of that year is supposed to provide operating information. Census forms are sent out in early 1983. Perhaps some 1982 closures did not receive the forms or decided not to fill them out. Even so, when

the DES/survey data base closure rate is calculated for the period from 1978 through 1982, the closure rate only moves up to 13%.

As a result of the lack of any other explanation, I have come to believe that the LED overcounts plant closures because it contains a significant number of permanent plant numbers which were inappropriately terminated, probably when there was a change in ownership. As a CES staff person noted, the Census and the ASM were not designed to be sources for longitudinal files. Consequently, the information needed to make the LED truly longitudinal was not collected on a systematic basis. For plants with stable ownership, longitudinal analysis using the LED seems to be an attractive and feasible prospect. However, as presently set up, the LED is not suitable for longitudinal analysis on issues involving closed (or new) plants.⁴ With some labor-intensive effort, such difficulties could be overcome if names and addresses were added to the file from the mainframe Census tapes. Then, on a project by project basis, identification of closed plants could be done manually if the CES client were able to develop an independent list of closures, as was done here.

The LED's level of spurious plant closings is of the same magnitude as those which we previously saw for DMI and ES-202 files, and the reason for this high level seems to be the same--unlinked accounts for the same plant operation. It seems reasonable to conclude that large inaccuracies can result from using longitudinal data bases with unlinked accounts, whether DMI, ES-202 or LED, for determining gross flows of jobs and counting establishment births and deaths.⁵

CHAPTER NOTES

¹A sample group is selected for five-year periods, with the first year beginning two years after the last census year (e.g., 1979-84). The sample is based on employment and industry figures determined in the census year. All establishments with 250 or more employees in the census year are included in the sample, plus a random sampling of smaller establishments, with care taken to ensure that all industries and areas of the country are adequately represented.

²The LED has been available for use by the general research community for a little over two years as of this writing.

³To provide myself with the opportunity of "playing" with the data despite the constraint that only CES staff could actually view the plant-specific data, I asked CES staff to produce a correlation matrix for each establishment group from which I could produce regression equations.

⁴This statement may or may not be true for plants of less than 50 employees, though I believe it is. We saw that the probability of a single-plant firm closing, at least in Rhode Island, is half that for multi-plant firms, and that, within single-plant firms, the probability of closure tends to rise from 50 to 175 employees. Moreover, while the Census Bureau does attempt to track ownership changes for large plants, it spends much less time doing so for very small plants. For the smallest plants in each industry (upper limit between 5 and 20 employees, depending on the industry), surveys are not even sent--IRS records are used. On the other hand, there is probably a higher real failure rate for new firms. Further, the evidence on acquisitions of single-plant firms in Chapter 4 suggests that such firms are less likely to change ownership (and stimulate spurious closures) than are large firms. Overall, given that the number of spurious closures seems to exceed that of the actual for plants above 50, I do not think the share of spurious closures for the below 50 group is low enough to permit satisfactory analysis for that group either.

⁵Recently, Mark Roberts prepared a paper for the Office of Strategic Planning and Policy Development in the U.S. Department of Labor in which he used the LED in an attempt to count the number of plant closings and related job loss from 1963 to 1982. He used PPN terminations as the proxy for closures, and as a result, I believe, his findings are too high. For instance, he estimated that 27.6% of all U.S. manufacturing plants with 20+ workers open in 1977 were closed in 1982. In three out of four intercensal periods, job loss due to plant closings exceeded that for contractions. (He did not publish closure job loss as a percentage of base year employment.) Roberts' findings were presented as an attachment to the recently published report of the U.S. Secretary of Labor's Task Force on Economic Adjustment and Worker Dislocation ("Sectoral Changes in Employment Due to Plant Openings and Closings, 1963-1982," July 1986, in Economic Adjustment and Worker Dislocation in a Competitive Society, December 1986)

VARIABLES IN REGRESSION MODEL
INTENDED TO EXPLORE RELATIONSHIP BETWEEN CHANGE IN
OPERATING CHARACTERISTICS AND EMPLOYMENT CHANGE

- 1) change in establishment employment: $TE_{7X+5} - TE_{7X}$ (7X is the base year, i.e. 1972 or 1977; 7X+5 is the next census year)
- 2) percentage change in establishment employment: $(TE_{7X+5} - TE_{7X})/TE_{7X}$
- 3) percentage change in establishment employment relative to percentage change in industry employment:

$$[(TE_{7X+5}^e - TE_{7X}^e)/TE_{7X}^e]/[(TI_{7X+5} - TI_{7X})/TI_{7X}]$$
 where "e" is for establishment and "i" is for industry

1) Establishment variables

a) inflation-adjusted change in production wage/hour:

$$([WW/PH]_{7X+5} - [WW/PH]_{7X})/\text{inflation factor.}$$
Inflation adjustment factor: 1972-77: 1.447
1977-82: 1.486

b) inflation-adjusted change in value added/production hour:

$$([VA/PH]_{7X+5} - [VA/PH]_{7X})/\text{inflation factor}$$

c) inflation adjusted change in production wage/value added:

$$([WW/VA]_{7X+5} - [WW/VA]_{7X})/\text{inflation factor}$$

d) inflation-adjusted change in cost of materials/value added:

$$([CM/VA]_{7X+5} - [CM/VA]_{7X})/\text{inflation factor}$$

e) inflation-adjusted change in total value of shipments:

$$(TVS_{7X+5} - TVS_{7X})/\text{inflation factor}$$

f) ratio of change in establishment average wage to change in industry average wage

$$([WW/PH]^e_{7X+5} - [WW/PH]^e_{7X})/([WW/PH]^i_{7X+5} - [WW/PH]^i_{7X})$$

g) ratio of change in establishment labor productivity to change in industry labor productivity

$$([VA/PH]^e_{7X+5} - [VA/PH]^e_{7X})/([VA/PH]^i_{7X+5} - [VA/PH]^i_{7X})$$

- h) ratio of change in establishment wages/value added to change in industry wages/value added

$$([WW/VA]^e_{7X+5} - [WW/VA]^e_{7X}) / ([WW/VA]^i_{7X+5} - [WW/VA]^i_{7X})$$
- i) ratio of change in establishment cost of materials/value added to change in industry cost of materials/value added

$$([CM/VA]^e_{7X+5} - [CM/VA]^e_{7X}) / ([CM/VA]^i_{7X+5} - [CM/VA]^i_{7X})$$
- j) ratio of percentage change in establishment total value of shipments to percentage change in industry total value of shipments

$$([TVS^e_{7X+5} - TVS^e_{7X}] / TVS^e_{7X}) / ([TVS^i_{7X+5} - TVS^i_{7X}] / TVS^i_{7X})$$

2) Firm variables

- a) change in total firm employment: $TE^f_{7X+5} - TE^f_{7X}$
- b) change in FTE production workers: $[PH/40]^f_{7X+5} - [PH/40]^f_{7X}$
- c) percentage change in total firm employment relative to percentage change in industry employment:

$$([TE^f_{7X+5} - TE^f_{7X}] / TE^f_{7X}) / ([TE^i_{7X+5} - TE^i_{7X}] / TE^i_{7X})$$
- d) percentage change in firm FTE production workers relative to percentage change in industry FTE production workers:

$$([PH/40]^f_{7X+5} - [PH/40]^f_{7X}) / [PH/40]^f_{7X} / ([PH/40]^i_{7X+5} - [PH/40]^i_{7X}) / [PH/40]^i_{7X}$$

3) Dummy variables for SIC 2241 and 3911

2241	PPC 1	DV1=1 and DV2=0
	2	0 1
	5	0 0
3911	PPC 1	DV=1
	2	0

CHAPTER 7

SUMMARY OF FINDINGS AND IMPLICATIONS FOR ECONOMIC DEVELOPMENT RESEARCH AND POLICY

Summary of Findings

At the beginning of this thesis, I pointed out that effective policy responses at the Federal, state and local levels are hindered by the lack of understanding regarding the magnitude of and reasons for manufacturing employment change. I suggested that, in particular, two types of information are needed. First, researchers and policymakers need a more thorough understanding of the dynamics of gross job loss and gain, i.e. the magnitude of the contribution of the various components of economic change at the plant-level (births, deaths, contractions, expansions); the magnitude of the "churning" that goes on in plants, as people are laid off and brought back; and patterns of change in gross flows that occur with shifts in the business cycle. While a number of gross flows analyses have been carried out, their accuracy has been compromised by the use of data bases which are not truly longitudinal. The second type of knowledge needed by researchers and policymakers concerns the macroeconomic, structural and institutional factors associated with job loss and gain. Only through understanding the magnitude of and the reasons for employment change can effective economic development policies and programs be designed and implemented.

In an effort to help fill this informational vacuum, I carried out several types of analyses of the manufacturing sector of Rhode Island for the 1978-83, years which bracketed a substantial decline in the state's manufacturing employment. First, I performed a gross jobs flows analysis, which indicated that the state experienced substantial and complex patterns of employment change at the plant level that cannot be seen simply by looking at shifts in aggregate figures. Second, in order to better understand the roles of institutional, structural and macroeconomic factors in plant closures, I ana-

lyzed the relationships between the frequency of plant closures and plant organizational characteristics. Third, I examined the relationships between the magnitude of employment change in open plants and plant organizational characteristics. Fourth, I attempted to utilize the U.S. Census Bureau's Longitudinal Establishment Data file to examine the relationship between plant employment change and plant operating characteristics. However, this effort was not successful because of the presence of a large number of spurious closures in the LED.

Below I summarize the findings from these analyses. Afterwards, I discuss the implications of the findings for economic development research and policy and then make a few concluding comments.

--Gross Flows Analysis

Key finding of the gross job flows analysis include the following:

- o Significant gross job losses and gains occurred throughout the period of study. The majority of annual gross job losses were due to plant contractions. Plants which closed provided between 16% and 27% of annual job loss and 37% of the five-year job loss.
- o It is probable that a higher proportion of jobs lost in plant closings resulted in economic displacement than was so for jobs lost in contractions, because the latter included retirements, voluntary quits, and temporary layoffs.
- o A large number of jobs lost in contracting plants were regained the next year, with the percentage in direct relation to economic conditions. Thus, a significant amount of job "churning" went on at the plant level.
- o Job loss through plant closures appeared relatively more sensitive to the length of the recession than did job loss through contractions. Specifically, the percentage of lost jobs due to closures, and the actual number of closure-caused job loss, increased significantly with the depth and length of the

recession. Increases in job losses due to plant closings as the recession deepened were primarily due to increases in job losses due to the liquidation of plant operations (particularly firm closures). Job losses due to relocations seemed less sensitive to the business cycle.

- o As the manufacturing employment decline bottomed out, there was a dramatic drop in gross job losses (from both contractions and closures) and a dramatic increase in the gross job gains.
- o Contracting plants lost more jobs on average than did growing plants. In times of growth, the reverse may be true. To the extent that the reverse is not true, the introduction of labor-saving technology may be the reason.

The analysis made clear that not only was it feasible to construct a truly longitudinal data base but that an accurate picture of gross flows patterns cannot be obtained unless spurious births and deaths are accounted for. A comparison of the findings of this study with gross flows analyses using unlinked data bases indicated that the latter substantially overcounted job change due to establishment births and deaths and undercounted that due to expansions and contractions.

--Analyses of Plant Closures and Employment Change

Through building a series of logit regression models, I examined the relationships between one component of employment change, plant closures, and plant organizational characteristics. I followed this with a descriptive analysis of the closed plants which looked in detail at the reasons for closures and the disposition of plant operations after closure. On the basis of these analyses, I developed the following argument regarding the dynamics that bring about plant closings:

- o Plant closings are the results of institutional responses to macroeconomic and structural opportunities and constraints.

- o The institutional responses that result in plant closings are of two types: (1) management error which results in an unintended closure and (2) an intentional act of closing a plant which is perceived to be appropriate in light of external conditions.
- o Institutional responses that result in plant closings appear to be very much a function of organizational characteristics. Certain characteristics reflect firms' abilities to appropriately perceive and respond to environmental conditions, and so appear related to the extent to which management error results in closings. Other organizational characteristics guide firms' in their perceptions of viable investment options, and so seem related to the extent to which closings occur out of intent.
- o Structural and macroeconomic opportunities and constraints strongly influence the range of investment choices which a firm perceives before it and the margin for management error before an unintended plant closing occurs.

Four types of plant closures took place--firm failures, product terminations, excess capacity reductions, and factor cost relocations and consolidations. The logit and descriptive analyses led me to a number of conclusions and speculations regarding the role played by particular organizational characteristics in influencing the frequency of plant closures:

- o Plants in multi-plant companies were twice as likely to close as were single-plant firms, in large part because the latter are more "lumpy" than the former.
- o The probability of closure for single-plant firms held by multi-plant owners was similar to that for plants in multi-plant firms. This occurred perhaps because multi-firm owners were overextended or had less personal investment in an individual business because their income came from a number of sources.

- o Small firms were more likely to fail than are large firms.
- o Non-RI firms were far more likely to relocate operations than were RI firms. However, it is unclear the extent to which this dynamic was a function of headquarters location and the extent to which it was a function of firm size.
- o The probability of a plant closing was very high immediately after acquisition, both because any problems of the new management tended to appear quickly and because acquiring firms absorbed the new operations by consolidating them into other sites.
- o In multi-plant firms, small plants were more likely to close than large ones. I suggested that this might be so because in capacity reductions firms would tend to eliminate small amounts of capacity, larger plants are more "lumpy," smaller plants might have lower economies of scale, and they may belong to small firms, whose management may not be as skilled as that in larger firms.
- o In single-plant firms, the probability curve relating plant size to probability of closure was bell-shaped. This may be because firms in the 100-225 range are at the outer edge of the range in which a non-professionally trained, family management style can be successful.
- o Very young "firms" (which may be divisions or subsidiaries) were more likely to close a plant than were older firms.
- o In general, percentage change in industry employment appeared to inversely influence the probability of a plant's closure. However, this was not so for single-plant owners, who may have been less sensitive to industry change as the plant was their only means of livelihood.
- o Union presence, plant/firm in same industry, and publicly traded were not significant variables in explaining the probability of plant closure. Union presence was a factor for a few firms with a predisposition to be geographically mobile or with a history of union conflict. Some plants were

closed because their products were not their firms' primary concern, even though the plant and the firm were in the same industry.

The OLS regression models relating plant expansions and contractions to organizational characteristics indicated that the latter could do little to explain the former, with the exception of the plant's product. It appeared that other, more subtle factors were at work. However, these findings reiterate the fact that plant closures, as reversals of categorical investment decisions, are indeed phenomena distinct from other types of employment change.

The Goal of Economic Development and the Roles of Government

How one perceives the implications of this study's findings for economic development research and policies depends in large part upon what one thinks are the goals of economic development and the proper division of roles in economic development among various levels of government. Before describing what I think are the implications of the findings, I lay out the context within which I draw these implications.

The goal of economic development should be the achievement of shared and sustainable economic well-being for a region's residents. The fruits of the economy should not accrue to just a select few, but to as many as possible. Moreover, development should occur in a way that does not detract from an economy's ability to continue to provide for the economic well-being of its residents in the future. Thus, development officials should not only be concerned with the number of jobs created and retained, but with their quality (e.g., wages and fringe benefits, room for advancement, protection from harassment), stability, and harmony with the preservation of public goods on which people depend, such as open space and clean water and air.

For a number of reasons, state and local governments should have primary responsibility for designing and carrying out regional development strategies. To be economically effective, regional development policies must be custom-fit to the specific

regional economic circumstances. Local development authorities have the at-hand knowledge and political investment to design and implement strategies that are custom-fit. Further, development policy is not a technocratic exercise but a cooperative one involving government, business, labor and universities which is best directed from within an economy. In addition, a plethora of regional development policies encourages experimentation, innovation and the rapid diffusion of information about experiences with various types of programs.¹

The performance of Federal responsibilities with regard to national economic development--in the realms of monetary, fiscal, trade, and industry-specific policies--of course have large effects on the health of regional economies. The direct Federal role in regional economic development should be to support state and local efforts. The Federal government has a number of unique supportive roles to play because of its powers to collect and redistribute tax revenues, to broker interactions between states, and to determine nationwide standards of behavior for both firms and subfederal governments.

Implications of the Findings for Economic Development Research

While Rhode Island is a state yet, it is small both in terms of area and population (under 1 million), it has the characteristics of a metropolitan area. Consequently, one of the implications of this study for further research is that the analytic methodologies employed are feasible both at the level of the state and substate area.

--Longitudinal Establishment Data Analysis

The gross flows analysis indicates the feasibility and usefulness of gaining understanding of local economic conditions through ascertaining the components of local employment change. Accurate gross flows data can enhance understanding about the patterns of employment change at different points in the business cycle (which could

help in predicting the bottom of recessions and the top of booms); the importance of plant closings as a source of job loss; the extent to which contractions and expansions represent "churning" (in which lost jobs are regained in the next year and vice versa) and the extent to which they represent permanent job gains and losses; and the relationship between firm size and job generation. Moreover, the completion of gross job flow analyses in areas with industrial structures different than Rhode Island and for periods of economic expansion would add substantially to the body of knowledge about the dynamics and components of economic change.

As I have shown, major accuracy problems develop when unlinked data bases are used for gross flows analysis, which has been the methodological norm to date. Linked analyses are not feasible using the DMI or LED files as presently constructed. The extent to which linked ES-202 files exist is not clear--the situation varies from state to state. However, it does seem certain that to the extent linked ES-202 files do exist, linked gross flows analyses are rarely undertaken.²

This situation could be remedied if Federal and state governments took the initiative to increase the availability and utilization of linked data bases. The U.S. Department of Labor, which specifies ES-202 data methodology, could require state ESAs to submit linked ES-202 data when they submit their quarterly figures to the Bureau of Labor Statistics. Then both the states and BLS would be able to run linked gross flows analyses. BLS also could offer demonstration grants to ESAs to encourage them to undertake linked gross flows analyses. Even without BLS edicts or encouragement, individual states could undertake a linkage effort and gross flows analysis on their own.

The U.S. Small Business Administration has built its U.S. Establishment and Enterprise Microdata File (USEEM) around unlinked DMI data. The USEEM was constructed in accordance with a Congressional directive and is the source of most SBA analyses of small business dynamics. Accounts in the USEEM are not linked. If they were, and if Dun & Bradstreet increased the frequency and accuracy of its data collec-

tion effort, the USEEM would be useable for longitudinal studies involving plant and firm births and deaths. The SBA is aware of the problem and is in the process of negotiating with Dun & Bradstreet regarding the latter's providing linked accounts in the future.³

If correctly linked, the U.S. Census Bureau's LED file could serve not only for gross flows analyses in manufacturing but also for analyses of the relationships between operating characteristics and employment change. However, the cost of linking all establishments in the Census of Manufactures would be prohibitively expensive. As mentioned in Chapter 6, the usefulness of the LED would be enhanced if establishment names and addresses were added to the file because linkage would be possible in cases such as this study, in which the client has an independent list of closures. The Annual Survey of Manufactures provides an almost ready-made longitudinal file, as the Census Bureau takes great care, it says, in tracking ownership changes. To make a 5-year ASM sample fully longitudinal, the Bureau would need to link accounts of plants that leave the sample early or come into it late because they are bought by or sold by firms not in the ASM sample. However, because the ASM is a sample and because the analysis of operating characteristics can be done only on an industry-specific basis, regression models enabled by a linked ASM sample would need to cover areas large enough to provide sufficient cases for statistical analysis. For instance, the ASM sample for New England was too small for those industries I wanted to examine.

--Plant Closure Analyses

This study also has demonstrated the feasibility and fruitfulness of carrying out regression and descriptive analyses of a population of manufacturing plants for the purpose of understanding the relationships between plant and firm organizational characteristics and plant closures. I think that states and localities would find such a study useful in gaining an understanding of the dynamics of their economy on which intel-

ligent development policy can be built. Moreover, the data base of organizational characteristics provides an excellent profile of an industrial sector. Once established, its updating could be routinized. In instances in which a development authority wishes to interact with particular types of firms, e.g., new ones, out-of-state ones, recently acquired ones, the data base could provide the contact list. The data base also could be expanded to firms outside of manufacturing, e.g., traded firms in the service sector.

While access to Rhode Island ES-202 data certainly was useful for the plant closure analysis, that analysis was the only part of the thesis for which such access was unnecessary. The biannual series of state manufacturers directories would have sufficed in providing a population of the plants for which data could be collected through the telephone survey. As outside access to ES-202 data is often restricted, even to other state agencies, the availability of an alternative and fairly complete list of larger plants is crucial to the feasibility of a plant closing study.

--Analyses of Expansions and Contractions

The OLS regression models demonstrated that organizational characteristics are not particularly powerful explainers of expansions and contractions in open plants. The implication is that in order to better understand these dynamics, researchers need to explore both the possibility of introducing other quantifiable plant characteristics into statistical models as well as the use of a more qualitative, case study type of approach.

Implications for Economic Development Policies and Programs

The findings have a large number of implications for state and local economic development policies. Where the results seem generalizable, I will describe the implications broadly; otherwise, I will discuss them in terms of Rhode Island specifically.

The magnitude of job loss identified here indicates the need for a well researched and thought out economic development strategy which identifies priorities and possibilities for job retention and job replacement. The analysis provided little information on levers that planners might use to minimize job loss due to plant contractions. However, the study did demonstrate that plant closures are phenomena clearly distinct from contractions, that closures are an important contributor to job dislocation, and that there exists a strong and complex series of relationships between plant closures and organizational characteristics. These relationships have implications for policies which aim at preventing plant closures.

Very importantly, the plant closing analysis demonstrated that plant closures are the result of institutional responses to the economic environment. That the environment does not "dictate" that a plant must close implies that there is room for programmatic intervention at the institutional level. This finding is important for state and local governments, which are not positioned to have great influence over structural and macroeconomic conditions.

As we saw, certain types of plant closures are the unintended results of management error and others are perceived by management as proper responses in light of environmental conditions. Moreover, we saw that certain organizational characteristics reflect management's ability to avoid unintended closure and others reflect how management is likely to perceive its viable options for plant siting. Consequently, a major implication of this study is that development officials should use an understanding of the relationships between organizational characteristics and plant closings as an aid to designing programs aimed at minimizing job loss due to plant closures.

Almost all firm closures, many product termination closures, and a few capacity reduction closures in Rhode Island were the result of management error. We saw that closures were much more likely to occur soon after firm ownership changed hands or a large firm started a new subsidiary. In addition, we saw that small firms held by

owners with other major business interests also were much more likely to close, with the possible reason, I suggested, that the owner could not or did not give the business his full attention. And we saw that some unintended closures occurred soon after a son inherited a business from his father or when long-term owner either overreacted (by overexpanding) or failed to react to changing market conditions. These dynamics indicate the need for a good system of management support, one which includes adequate and affordable counselling, training and consulting services. The role of a state is to see that such services exist and that business owners are aware of their availability. Moreover, a state may want to develop an outreach program which targets new owners and owners of several companies.

For the majority of unintended plant closures, at least in Rhode Island, the firms seemed to be small and locally-based. The logical clients for a management support system are these types of firms because the top decision-maker is close by, and the management skills of these types of firms are the weakest. However, a management support system could be marketed to larger and non-local firms who are commencing operations in a new market or product, e.g., the Spanish cabinet company.

Even with a good management support system, many firm failures of local companies will occur. It is likely that in a number of these cases, the assets of the firm--its product, equipment and workforce--allow the possibility that it could be resurrected under new and competent management. It is in a state's interest to attempt to broker transfers of ownership than can result in firm turnarounds. Traditional lending sources are loathe to provide financing in such situations because of the high risk. A state should consider targeting development finance monies to provide capital in such high-risk, high-payoff situations.

The study indicates that local companies were far more stable geographically than were out-of-state companies. Consequently, it appears to be in the Rhode Island's interest, if not other states as well, to encourage not only strengthening th management

of weak local companies, but the development of strong, indigenous companies generally. States are developing a wide body of experience in this area. Means of aiding local manufacturing firms include development finance programs, assistance in obtaining government procurement contracts, technology transfer programs, technology development programs, buyer-supplier matching programs, incubator programs, programs encouraging employee ownership, and export promotion programs.

Within economic development circles, David Birch's findings in "The Job Generation Process" that small and new firms create most new jobs are taken as gospel, and have been used to justify a large number of the state and local programs aimed at encouraging indigenous development. In this study, I believe that I have conclusively demonstrated that Birch substantially undercounted the number of spurious births and deaths, and so overcounted the contribution of small and new firms to job creation. Moreover, the gross flows analysis showed that very few plants under 50 employees in 1978 grew to a level above that figure by 1983. However, given my lack of data on small plants and that I did not look at the job creation process in the up side of the business cycle, I think this thesis does not provide any substantial evidence regarding the role of small firms in job creation one way or the other. We did see that small firms did have greater plant stability, and from this I drew implications.

In pursuing a strategies of job retention and indigenous development, a state should focus its efforts on companies that provide well-paying jobs. In Rhode Island, one-quarter of the jobs lost through plant closings were in the low-wage jewelry industry. The study also suggests that a large number of the local companies were in lower-paying industries such as jewelry, textiles, and novelty items. Thus, Rhode Island needs to keep in mind the extent to which there exists a tradeoff between stability and wage levels. The state's ranking of 50th in value added per production worker does indicate that an intelligent strategy to create better manufacturing jobs is in order. Such jobs are particularly needed currently because the state has the highest rate of housing

inflation in the country. Metropolitan Providence housing prices are up 41% from a year ago.⁴ As wages have been unable to keep up with housing costs, housing affordability has replaced job displacement as the state's major economic issue.⁵

Many firms closed plants out of intent. A state should design development strategies that minimize vulnerability to intentional closures in which decent jobs are lost. The fact that between 1978 and 1983 a large number of non-RI headquartered plants left the state and there were very few plant births under non-RI firms occurred implies that a state should have a clear awareness of the cost-effectiveness of any plant attraction strategy. Rhode Island should seek to attract firms which choose the state because it has a clear and long-term competitiveness with regard to access to particular factors, e.g., university researchers in particular fields, experienced shipbuilders. On the other hand, it probably would not want to spend significant resources going after manufacturers who choose RI on the basis of its low labor costs, because that advantage is ephemeral.

We saw a number of cases in which plant closures occurred after conglomerates bought and then sold local companies, and in which non-RI firms acquired local ones and then moved operations elsewhere. In addition, one case of voluntary firm closure occurred after the owner could not find a local buyer for several of his operations, so he closed them and sold the assets to out-of-state interests. The implication of these findings is that it is in Rhode Island's interest, if not other states as well, to encourage the retention of in-state ownership of manufacturing plants. Such an objective brings the state into relatively uncharted economic development waters. It might seek ways of brokering the sales of local firms to local buyers, and perhaps support such sales with a development finance program. In addition, the state might explore regulating the takeover of in-state firms by out-of-state ones in a manner that would inhibit acquisition and immediate closure by new owners. For instance, it might want to explore the

idea of using its powers of eminent domain to prevent relocations that occur soon after an acquisition.

In the study, I could find no statistical evidence that the presence or absence of workforce union affiliation affected the probability of plant closure. Only one firm closed plant doors primarily because of a union and the state's "business climate" with regard to labor (Davol). It seemed that for the other two firms that moved plants for labor reasons, Rhode Island labor costs relative to those at the new site (Mexico, Alabama) were the primary motivation, and union presence was secondary. These findings suggest that the state need not attempt to use its powers to diminish the presence of unions as part of a strategy of plant retention.

A number of findings point to the potential usefulness of an "early warning" system for anticipating plant closures. As might be expected, the probability of plant closure was directly related to how employment was faring in a plant's industry nationally. This finding suggests that a state would find it fruitful to track both state and national trends in key industries to identify those in which closings might occur because of shifts in demand. New acquisitions, startups, and small plants with larger sister plants could be targeted for particular attention. An early warning system also could watch gross job flows for leading indications of potential shifts in the frequency of plant closures. At the same time, the state, through its field representatives in various agencies, could develop contacts in individual companies who could inform the state if an intentional closure is being considered. The state could then attempt to forestall a closure, by helping to solve the problem, or plan for post-closure adjustment. A number of states are experimenting with the operation of early warning systems.

The study findings do not directly shed any new insight regarding the role for the Federal government in regional economic development policy and programs. As I said earlier, I think that the role of the Federal government should be to provide financial and informational support to state and local efforts, e.g., coordinating data

collection, promoting regional economic analysis, evaluating the effectiveness of various development strategies, and providing development funds to hard-hit areas financial encouragement for innovative regional policies.

This study did not examine the extent to which firms closing plants gave notice of closure or mass layoff, nor did it look at the particular consequences of layoffs for displaced RI manufacturing workers. Even so, the depth of manufacturing job loss in Rhode Island supports the findings of other numerous studies that specific policies and programs need to be established that aim at easing the adjustment of workers once laid off. I do think that while states should take the lead in the design and creation of development policy, the Federal government should set the standards and provide the funding for a number of programs and policies designed to aid dislocated workers, in particular requiring employers to provide adequate notice of intentional layoff and ensuring that employers and states work together to provide the rapid delivery of adjustment services such as outplacement and retraining. States are loathe to enact laws requiring firms to provide adequate notification because they believe that states without such laws will be perceived as having a better "business climate" and so have a competitive advantage in attracting businesses. A Federal law can eliminate these perceptions of disadvantage. The rationale for Federal mandating of adjustment services is that it is in the fiscal and economic interest of the country to reduce the length of unemployment and increase the match between available skills and available jobs.

Federal inaction with regard to adjustment policies does not mean that states need be inactive as well. In the absence of a Federal layoff notification law, states should consider creating their own, as Hawaii just did. Also, a large number of states have created "rapid response" teams, incorporating representatives from a variety of development, employment, training and social service agencies, that attempt to react to potential and actual plant closures.

A Concluding Note

I think that the contributions of this thesis are several. I believe that the analysis has resulted in a new degree of specificity with regard to the dynamics of manufacturing plant closures. We see that plant closures indeed are a phenomenon distinct from job loss through contractions. The descriptive analysis provided what I hope is a typology of closures which may be useful in further research and policy analysis. Also, I believe that the analysis demonstrates that plant closures result out of the tension between institutional, structural and macroeconomic factors. Importantly, institutional factors never seem to be absent in a plant closing, which means that there is room for positive programmatic intervention by state and local governments. I demonstrated that a number of organizational characteristics are strongly related to the probability of plant closings. The strength of the relationships between characteristics and closures indicates that governments can use knowledge about characteristics to anticipate, prevent, and plan for plant closures.

The gross flows analysis indicated that plant closures, while a significant contributor to gross job loss, are not as important as previously believed. It also demonstrated that a substantial amount of "churning" goes on within plants, as jobs get deleted and created one year after the next. And the analysis showed that gross job flows have patterns very much tied to the business cycle which may be useful in helping to anticipate future changes.

Finally, I think that this thesis has made a major contribution by developing replicable methodologies for in-depth economic analysis. The analysis of plant closures suggests that utilization of a combination of primary and secondary data sources, logit regressions and descriptive analysis can produce meaningful and rich results. In addition, I have demonstrated that an accurate gross flows analysis using a linked data base is quite feasible. In doing so, I have shown that major errors occur in gross flows

analyses when spurious plant births and deaths are not accounted for, to the detriment of understanding regarding the workings of the economy.

For too long, researchers and policymakers have had to work with aggregate data, anecdotes, and establishment data bases inappropriate to the analytic task. My hope is that other researchers will find the methodologies and results developed here to be guides and stimuli for undertaking studies which add to the understanding of regional economies and the design of effective development policies.

CHAPTER NOTES

¹Andrew Reamer, "Testimony before the Subcommittee on Intergovernmental Relations and Human Resources, Government Operations Committee, U.S. House of Representatives, December 4, 1985," published in Federal and State Roles in Economic Development: Hearings before a Subcommittee of the Committee on Government Operations, U.S. House of Representatives, December 2, 4, and 5, 1985 (Washington, DC: Government Printing Office, 1986).

²The Oregon Department of Economic Development and the Oregon Employment Division are jointly undertaking a firm-level gross flows analysis using a linked ES-202 data base. The state will be making the data base available to researchers on the condition that the latter sign a confidentiality agreement.

³Telephone conversation with Catherine Armington, Applied Systems Institute, Washington, DC, May 4, 1987. Armington suggests that one reason it was not feasible to link DMI accounts in the past was that D&B reused DUNS numbers.

⁴John King, "N.E. house prices continue to soar," Boston Globe, May 12, 1987. The price increase is measured from March 1986 to March 1987. As of the latter date, Providence's housing prices were ranked 9th of 51 metropolitan areas. The metro area includes 86% of the state's population (according to the 1980 census).

⁵Personal communication with Frederic G. Reamer, Chair, Governor's Human Services Advisory Council, State of Rhode Island, May 5, 1987.

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